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Wild Gallantry

By ARCHIBALD RUTLEDGE

Illustrated by R. Bruce Horsfall

Not long ago a doctor said to me that the average human being has no idea of the amount of valor in the world; that he himself had known little of it until his profession compelled him to meet, in homes and in hospitals, people who, handicapped by disease or by accident, met their ordeal with a fortitude that was all the more noble because it was obscure. Of course, all of us know a few people of this kind; and they always have our unfeigned admiration. It is never how high one rises that determines one's merit; but rather how far one has come, considering his difficulties, especially the impediments that illness or mishap may have laid upon him. When I see a one-armed man playing golf expertly, or even trying to play it at all, the feeling I am impelled to have for him goes a little deeper than mere admiration. Such a display of spirit calls for quiet reverence, for it is by just such spirit that humanity is often redeemed. We like a normal person who does not quit; but we are always moved by the spectacle of one who, embarrassed by some physical difficulty, dauntlessly carries on. I call that gallantry.

But it is not alone in human life that endearing valor is found. I have observed it in Nature, among the creatures of the woods and fields; and a consideration of this fact somehow lends to all life a greater dignity and a more noble significance. I might begin by saying that in the natural world there appears to be an absence of that foolish and false courage that, so prevalent among us, especially among younger people, we recognize as foolhardiness. I have not found in Nature what we might call a display of courage. Where it is found, it has been called forth by the exigency of the situation.

All living things are handicapped by infancy. It is during this period of defencelessness that Nature has endowed mothers, and to a far less and a different degree, fathers, with a valor that has as its purpose nothing less than the integrity of the species. They guard tomorrow with their lives, and life is uncertain in Nature's world.

Walking through a grove of young pines one day, I was startled to have a bird fall, as if it had designedly hurled itself, at my very feet. There it lay, with wings pitifully outspread, fluttering feebly. Recognizing me as an enemy, it simulated helplessness in order to draw me away from its precious babies. The bird was a mourning dove. As I looked up in the small pine out of which this devoted mother had apparently fallen, I saw the frail nest, and in it the two young birds. The mother meanwhile was exposing herself to peril in order to distract me away from her young. In that fluttering bird there was more than a wild thing trying a common ruse: in it I saw Mother Love, mysterious, self-sacrificial, holy. And I do not believe one should be accused of being merely sentimental if from such a scene he infers that the Creator not only made things, but, more marvelous still, provided for their continuance. Self-preservation is called the first law of Nature; but it does not seem to work with mothers. The preservation of their children often makes them completely self-forgetful. Perfect love, the Bible reminds us, casteth out fear. It is so. I have seen it with my own eyes.

We used to have on our plantation a cow bred in the swamps, and so wild that few people had ever seen any more of her than the tracks she made. The Negroes were more or less superstitious about her, her vanishing quality suggesting occult powers to them. But one day in April I came upon the cow standing on an old river-bank. Cardinals were singing; Carolina wrens were calling; yellow jasmines were tossing their saffron showers over almost every bush. And here stood this wild cow, letting me approach her. I could not understand it; I thought she must be sick. On the two or three occasions on which I had seen her before, she had torn off through the woods with the speed and the wild energy of a deer. Now she stood placidly, almost dreamily. Violets were on the bank all about her. Could it be that the fairy festival of the springtime had tamed her savage breast? Cautiously I drew near. I noticed that she kept looking at the ground,

"THE TINY CHAMPION PUT THE DARK MARAUDER TO FLIGHT"

fixing her eyes on a clump of little canes before her. I thought for a moment that she might have been struck by a deadly serpent. But her whole attitude was explained to me when she took a step forward, bowed her head in the canes, and began to lick something there. I knew then that she had a calf. A moment later she threw her head up, fixing me with eyes that had exchanged the love in them for stern warning, at the same time coming forward a few steps, so that she now actually was above her drowsing baby.

From her attitude I knew that I was in danger, and from a creature that heretofore had dreaded the sight of me. If love does anything, it transforms natures. Here I saw it triumphing over ingrained and lifelong apprehension. Watch mothers with their young if you want lessons in courage. The ruffed grouse, among the shyest of birds, will literally fly into the face of a fox if he comes near her elfin children. I have had a mockingbird strike me savagely when I got too close to its nest. Even the hummingbird has a stout heart. He is a knight errant if there ever was one.

The smallest bird in the world, the only one that can fly expertly straight up and down, borne with the speed of a bullet with dextrous precision on gossamer wings, the ruby-throat has a great heart. If you do not believe me, try to approach his nest.

One spring I discovered one of these tiny woodland bassinets, delicately bound with lichens to a low limb of a white oak. I used to take my writing near the nest in order to study these flowery elves. At the time of this incident, the mother was setting; and the male spent much of his time perched on a dead twig near her. Iridescent in his gleaming armor, he acted as both valiant sentry and as devoted lover. One afternoon when I was near, a big shadow skimmed across the grass. Looking up, I saw a great bald eagle beating his way powerfully to some distant haunt of his. He was flying just over the top of the oak. The little knight on guard-duty never hesitated an instant. Darting from his perch, mounting the sky like a beam of light, he either attacked, or simulated an attack on, the eagle, whose comparatively huge form bulked black in the sky. And the tiny champion put the dark marauder to ignominious flight! Perhaps the eagle thought the hummingbird was a bumblebee. At any rate, the largest and fiercest of our birds of prey beat a precipitous retreat. Then the fairy champion returned with defiant assurance to his perch; and it seemed to me that his wife looked at him adoringly, as if she were proudly murmuring to herself, "What a man! What a man!"

You must see hummingbirds often about your garden flowers. You think of the miracle of their being; you wonder also over their exquisite beauty. Remember also their courage, which can be greater than is that of many human beings.

Sometimes a difference in size and stamina makes remarkable the resolution of a wild creature. On Murphy's Island, near the mouth of the Santee River, there are a great many deer; and, until recently, a great many cattle as wild as the deer. They were the descendants of a small herd liberated in those jungles almost a hundred years ago. At sundown one day I was watching some deer coming forth from their dewy daytime fastnesses to feed in the marshes. A noble buck was with them. Not far off I saw the notorious herd-bull of the cattle, a creature that had driven up trees several men who had been trying to shoot him. He was a huge black minotaur, with a massive neck and short, sharp, and polished horns. His attitude was one of menace. For some reason, one of the does was limping, and the buck was walking beside her, apparently shielding her.

As the deer must have been familiar to him, there could have been no sensible reason for the bull's evil mien. Probably from sheer truculence he lowered his great head, lolling it from side to side, bellowed dimly but awesomely, and advanced slowly toward the crippled deer. In Nature, especially among surly old males, it sometimes happens that one will attack without provocation, perhaps merely to assert superiority.

What the bull's real intention may have been, I had no way of knowing; but his approach was surly and threatening. When the stag saw the monster coming, he halted and half turned, while the doe moved painfully

"THERE IT LAY, WITH WINGS PITIFULLY OUTSPREAD, FLUTTERING FEEBLY"

forward. The buck might have weighed a hundred and fifty pounds; the black bull would have turned the scales at close to two thousand. Yet despite the formidable appearance of this monster of the marshes, the proud buck lifted his antlered head, foreshortened his neck, and blew a challenge from his black nostrils. The bull, mumbling ferociously to himself, and not watching carefully where he was going, so busy was he with the matter of creating a dread impression, came within twenty feet of the stag before he saw that champion blocking his pathway. As I watched, the affair smacked of the David and Goliath episode. Yet the bull halted, ceased his bellowing, and eyed his lithe and daring antagonist. Wild things fear both the hoofs and the horns of a deer; and for a moment the shaggy bull thought it over. After a few minutes, the buck standing steadfast, the bull lowered his head and pretended to browse. His bluff had been called. The stag, making sure that the black giant had changed his mind, turned and followed his fellows with quiet dignity. We learn from Nature as well as from human history that, to use the words of the great Edmund Burke, "Terror is not always the effect of force, and an armament is not a victory." Man, in these days, could learn from Nature.

When I was in college, the man who led my class throughout its course had to go everywhere in a wheelchair; and not one of us received the instinctive respect that this man merited and had shown him. And a study of humanity will reveal that Nature is the great compensator. Rarely does it happen that a physical Apollo is likewise a man of genius. Those who are hampered by physical handicaps nearly always develop a preternatural mental ability. Byron was club-footed; Alexander Pope was a pitiful weakling; Charles P. Steinmetz, whom I knew, was a hunchback. "A sound mind in a sound body" is one of those old half-true axioms. Many of the most remarkable minds in the whole story of our race had their homes in bodies that were pathetically weak or malformed. Few human beings have everything. Some of the sweetest-tempered people in all the world are hopeless invalids. To compensate for their handicaps, God gave them grace of heart.

In Nature we do not discover despondency, the handmaid of despair; we never find self-pity, which undermines virtue more subtly yet as effectively as arrant vice. Wild things do not resign or surrender; they will fight to the death. Even a butterfly will defend itself. All living things love life; and if we do not love it enough to make it seem worthwhile to ourselves and to others, a natural suspicion arises that there must be something the matter with us. Take self-pity out of life, and you would be making great progress in the redemption of humanity. It is really a disease; and, I take it, a disease incident to civilization; for certainly, as we go back toward Nature, we find less of it; and in Nature's home, none at all. Her children are valiant. Whatever may be their adversities, they do not complain; they are self-reliant; and they never lose hope.

Of all the mishaps in Nature, for a bird to have a wing broken is one of the worst; yet I know from long observation that such a bird never despairs; and in many cases it may elude its enemies and may actually recover. At such a time the bird not only becomes its own physician but exerts a more than normal alertness and ingenuity of avoidance. I have known a quail, a dove, and a ruffed grouse to come through such an ordeal safely; but the most remarkable case that ever came to my attention was that of a wild gobbler. A turkey that cannot leave the ground is liable to fall an early victim to a fox, a wildcat, or even a weasel, all of which are prowlers of the night. The first time I saw this superb wild bird he was lying in the sun on the sandy slope of a bank, ruffling his feathers and dusting himself. Every now and then I noticed that he would use his bill to push his left wing back up toward his shoulder. At last, when he stood up, I saw that the wing hung down too far, and at an awkward angle. It had been broken. When I showed myself, he ran off into a thicket of hollies and sparkleberries; but as this copse was of wide extent, I did not think he had

gone far. Besides, a wild turkey has a fairly regular range, and will not usually wander far from his haunts. So I was sure that I should see this bird again, if no marauder killed him at night, when, I supposed, he would have to be sleeping on the ground. In that idea I was mistaken.

In the same woods at dusk a few days later, I heard a wild turkey walking toward me, and had no doubt that it was the crippled one. In the comparatively bare winter woods I could see a long distance. Now I both heard and saw the magnificent fugitive from death. Furtively he walked, regal yet apprehensive; a true king of the wilderness, yet now fallen on evil days. Curiously I wondered just how and where he would roost; but I was unprepared for the superior strategy he showed. Not far from me was a huge pine that a hurricane had thrown. It was broken some twenty feet from the ground, but the whole tree had never come to earth. The top was on the ground, and the stem made a gradual incline up to the point of the break. It was up this incline that I now saw this gobbler walk; sixty feet up the incline of that giant yellow pine.

"THE BULL HALTED AND EYED HIS DARING ANTAGONIST"

"But," I said to myself, fascinated by what I was watching, "I don't see how that is going to help him very much. That maneuver does not put him out of a wildcat's way."

The turkey evidently knew that the end of the incline was no safe place to roost; for, reaching there, he stood straight up (and how straight and tall a wild turkey can stand!), looking about, "readin' his book," as the Negroes say of a deliberating wild thing. After a few minutes I could see that he was getting a stance; then, after a crouch, and assisted partly by his good wing in his effort, he half jumped, half flew to the dense top of a holly, some eight feet away from the pine. There he settled down for the night, and there he would be safe. Lonely yet self-reliant, handicapped most vitally, with night coming on, this gallant bird helped to teach me the meaning of quiet prudence; of sagacity; of the virtue that finds a way out of difficulty.

The wild gobbler I have described was watched over a period of a month, by which time he recovered the use of his wing sufficiently to enable him to fly. He could not fly perfectly, and the healed wing made a curious drumming sound as the great bird rose, but he had won his battle.

Always it seems to me that too many people study Nature merely to learn about it. That is only the anteroom to the palace. Why not learn from Nature more about human nature and about life. Why not observe birds and animals with a sympathetic and discerning eye, finding in the way they live, in the way they endure, in the way they meet difficulties, that there is far more valor in the world than we had supposed, and that no human being can very well get along without it.

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Indian Summer

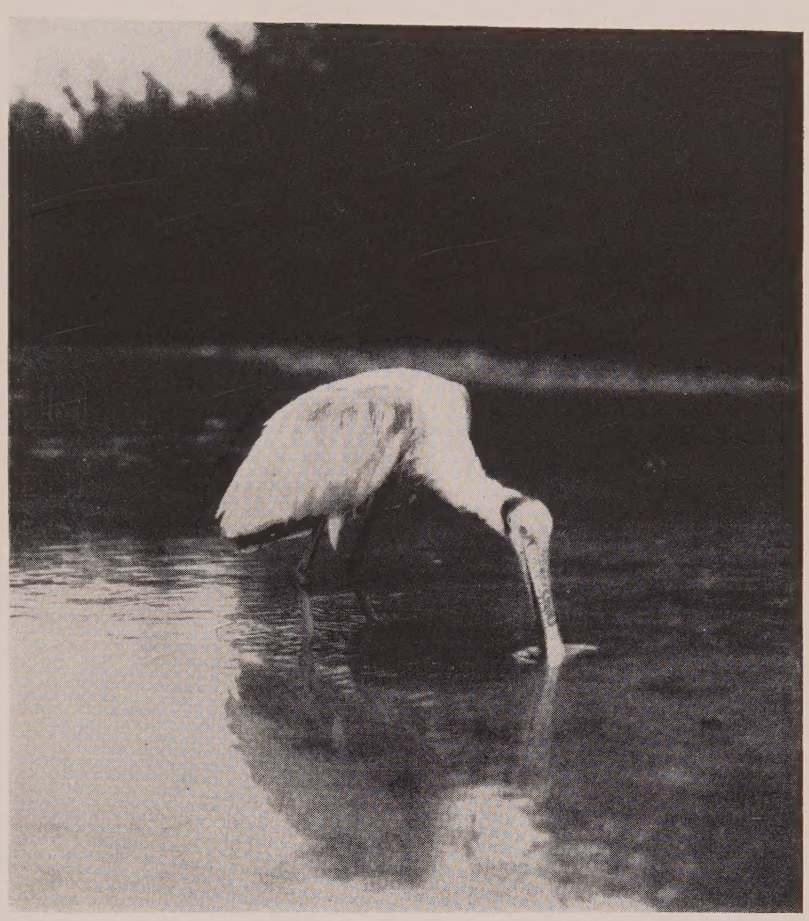
By LULU PIPER AIKEN

How slowly days go now! Crisp in the dawn,
They grow sun-warm and mellow after noon
And linger through the dusk, loath to be gone,
Blue-dreaming in the smoke of leaf-fires. Soon
The hours will draw their twilight closer; now
Shadowy mists web from an eastern lair,
Dimming the brilliance of the autumn bough,
Sheathing the too-bright world in tranquil air.
The lovely respite, though, time soon will sever—
Etched sharply are her poignant sky-flung words;
One thing the years have proved: summer is never
Truly content after the flight of birds;
Perhaps, against time bitter-grown, she stays
To give us, for a talisman, these days.

"Pink" Nights

By EDWARD J. REIMANN

DARKNESS. A diamond studded blanket spreads high over the keys. Warm breezes rush through the mangroves, and queer sounds issue from their depths. Across the water drifts a loud-voiced "quawk", followed by a long pause and a muffled beat of wings. It becomes louder as it circles overhead; and then gradually dims in the distance. Silence. A faint splash is heard and immediately a ray of light stabs out into the gloom. There appears an incredible object; a wading bird with long red legs, and an extended white neck. Its body is bathed in a rosy pink; scarlet epaulets adorn the shoulders; and naked green skin bares the forehead. Most fantastic is the spatulate-like bill, gray speckled with light brown. The bird dances to one side as it moves nearer. The light persists, the beam following the bird as it tries to escape but yet seems unable to fly. It utters a deep, grinding, "gruck-gruck", quickens its pace. The ray is in its eyes. Closer; closer; close. Now easy! There! Another roseate spoonbill has been caught and banded for the U. S. Biological Survey.



THE ROSEATE SPOONBILL IS A STRANGE BIRD

A wading bird with long red legs, long white neck, rosy pink feathers and scarlet epaulets, green forehead and spatulate bill

The region of this incident is the Ten Thousand Islands on the southwest coast of Florida. Saved from possible extinction by Audubon wardens, the roseate spoonbills are slowly but steadily increasing their numbers here. The mangrove keys are covered with soft mud and are flooded at high tide. Duck Rock, however, is accessible for banding the "pinks". This key is situated on the Gulf coast, about twelve miles south of the town of Everglades. For many years the wading birds have used it as a nesting and roosting site.

March finds the spoonbills in this locality, feeding on the mud flats of the inner keys, both by day and night. If the tide is low at sundown, they will remain long after dark, feeding until the flats are covered. If it is high at sundown, they will go directly to roost with the other waders at Duck Rock. There are about six nights out of every month when banding is possible, depending on tide and light.

Actual contact with the birds is best accomplished at a favored pool on Duck Rock. After one has concealed himself among the shadows of the nearby mangroves, patient waiting is in order for some time. Watching the rising tide and listening to the varied sounds of activity among the roosting herons and ibises, helps to pass the time. Frequently the numerous mosquitoes and sand flies make the vigil miserable enough, but what follows is well worth it. When once the "quawk" of the night herons coming in to roost becomes audible, it usually means that the "pinks" are close behind.

All is tense and quiet until the beat of wings is heard. A dark form momentarily blots out the stars as it passes by. It may be followed by many more, voicing their "gruck-grucks" as they settle in the mangroves. Then one will leave the roost to feed in the pool. Rapid wing-beats are heard as it checks the forward motion of its flight, to settle with a light splash.

On goes the light, a hand flashlight, and the bird jumps and nervously twitches its wings. The ray at first startles the bird and, sooner or later, attracts it. The bird tries to evade the beam and yet gets closer. Off on a diagonal path it goes, only to wheel and tack to the other side. Seemingly unafraid, it moves toward the light, occasionally with a lowered head, and sometimes stopping to turn completely around. At close quarters I am the more tense of the two, under the stress of keeping perfect silence, and directing a continuous beam into the bird's eyes.

Overanxiousness results in a total loss. My first experience netted me a handful of air, when I reached for the bird about fifteen inches from the light. Later, by

patient waiting and a steady hand I lured them within six inches. Hence their capture by hand was comparatively easy. I have spoiled a few chances by an uncontrollable fit of laughter at the ludicrous sight. Their general appearance, their queer calls, their heads lowered as if ready to charge, make a weird and comical picture.

Banding takes a short time. After being released, the birds commence to feed, moving to another pool. When the key is flooded by the rising tide, the banding finished, and one rows away, from across the water drift in for a time the "gruck-grucks" of the spoonbills. Then all is quiet among the many roosting birds on the islands.

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Pines in the Wind

By MARIE FISCHER

The pines are reeling galleons
Tossed on windy nights,
Their singing masts strung with stars
For swinging signal lights.

The pines are phantom galleons
Adrift through samite mist,
Their wraith-like sails the floating clouds
By ghostly moonbeams kissed.

The pines are pirate galleons,
Their chant a weird rune;
Their treasure-holds with silver filled
Stolen from the moon.

The pines are cargoed galleons
Laden with sweet spice;
The God of the trees built them so,
And launched with beauty thrice—

With music, fragrance, form,
Pine galleons ride the storm.

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Mares' Eggs

By ANN CORBETT HARRISON

Not far off the highway that runs south from Crater Lake, Oregon, lies Mares' Eggs spring, named for its distinctive plant life. The blue-green, unicellular alga that makes up "mares' eggs" is known scientifically as *Nostoc*. Minute cells are joined into chains, which, when they have reached a certain length, automatically break apart, and each section forms a new chain that breaks, renews—a process that goes on and on. Masses of chains are held together by a gelatinous substance, forming a spherical colony protected by a rusty-green sac. When a colony, or "mare's egg," reaches maturity, it disintegrates, and each fragment becomes the center of another colony. Eggs vary in size from a pin-head to that of an extra-big potato.

The spring is about an acre in extent, and shallow, four feet deep in the center where eggs pile high. Some roll off on the sand; white, black, and green—green, because of tiny fungi. Some are caught in the submerged willow and alder underbrush. The water is clear and cold—straight from the melting snow of the mountains about Crater Lake. Even on the hottest summer day, the temperature is never higher than forty degrees Fahrenheit.

Most Boy Scouts of the country about, and some university botany teachers, know of the spring and are interested in the unusual algae.

One student at Oregon State University, who had spent summer vacations in Klamath County, is said to have put what she had learned of "mares' eggs" and the spring in a theme. It was rejected on the ground that the girl had confused the English-schoolboy hoax, "mares' nest," with "mares' eggs," and that some one had played upon her credulity. She sped in a car to the spring, secured several specimens of the eggs, and, in their native water, brought them back to the university.

Paracelsus, in the sixteenth century, gave *Nostoc* its name. It is fantastically called witches' butter, star jelly, spittle of the stars. An old book speaks of *Nostoc* as an ingredient of soup, much relished by the Chinese.

FAMILY LIFE OF MR. AND MRS. FISH

Among the fishes some have developed instinct to protect the young

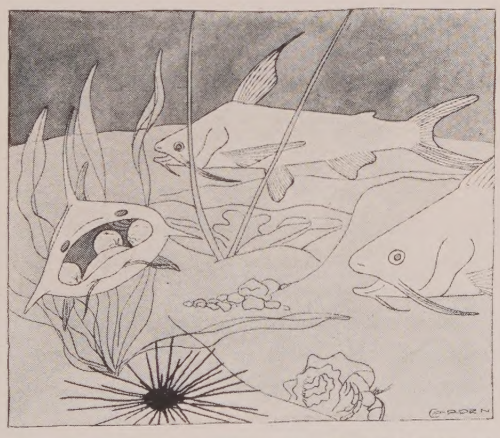
By FRANCES E. POTTS

Illustrated by Hope Carden

THE STICKLEBACK BUILDS A NEST FOR ITS EGGS AND PROTECTS THEM. THE BLACK OBJECTS ARE THE ATTACHED EGG CASES OF SKATES

MAN does not know at just what stage in the evolution of life parent-animals began to develop a desire to help their children through the tender and dangerous stage of their lives. We have, however, observed a few instances where the protective instinct is found in animal life as low as the fishes.

One of the most interesting and familiar illustrations is that of the sticklebacks. The males of this group build nests of water-weeds, binding them together with mucous webs or threads secreted from the kidneys. When satisfied with the nest, the male looks around for a mate to occupy it. If he does not succeed in attracting a mate, he resorts to force and drives a female—or several of them—into the nest until he has a satisfactory number of eggs. From the time the female deposits the eggs in the nest, her responsibility for her children is over. In fact, she would enjoy eating the little fish and probably would do so except for their vigilant father. Never during the period of incubation does he forsake his vigil, often fighting off enemies, and even the female, with the use of the stickles on his back. Not only does he guard his precious treasure, but, with the use of his tail and fins, he circulates water through the nest to provide plenty of oxygen and maintain purity. In case the current spills an egg, or a young fish strays out, he rescues it and returns it to the nest.



THE GAFF-TOPSAIL CARRIES ITS EGGS IN ITS MOUTH. HERE WE SEE A VIEW HEAD-ON AND FISHES SIDE VIEW

There is a marine catfish, the gaff-topsail, inhabiting the Atlantic and Gulf Coasts, the male of which assumes a remarkable family responsibility. Unbelievable as it may seem, he protects the eggs during incubation by holding them in his mouth. The incubation period may be a full month, and the eggs nearly an inch in diameter; the male may carry at times as many as fifty in this manner, although twenty-five might be nearer the average. Some scientists maintain that these fish may reach a length of four inches before being thrown out from under the parental roof. And Mr. Gaff-topsail does not eat during this time; at least such fish caught while cradling the eggs or young have not been found to have eaten. It may be added that the female in some species taxis the family around in her mouth during incubation, and, after the eggs hatch, swims about with the young ones. When the fry become frightened they dart back into her mouth for safety.

A fish inhabiting our Pacific Coast, the grunion, *Leuresthes tenuis,* selecting a time just following the peak of a high tide, swims in with her mate, bores her tail into the sand that is loosened by the tidal wash, deposits her eggs, which are immediately fertilized by her mate, and the two go on their way. Two weeks later, at the next high tide, the eggs hatch, and the tiny young make their way out through the churning sand of their nursery, and are able to take advantage of the ebbing wave to reach their ocean home. A wisdom far above that of any fish has taught these parents to time their actions to the clock of the universe.

The paradise fish is a nest-builder, but the material is of air bubbles. As the female drops her eggs, the male picks them up in his mouth one by one, blows them out with a bubble of air protected by a gelatinous sack, carries each to the surface, and there amasses them. He then stands guard to drive away hungry fishes, and to blow more bubbles to replace those lost by evaporation or by drifting.

The protective instinct, with male and female sharing in rearing the young, is found in the family lives of the sea-horses. The male has an abdominal pouch in which

the female deposits the eggs. He carries the eggs during incubation, and after the little ones have hatched. To expel them, either to try their fins or to embark into the watery outside world permanently, the sea-horse rubs his stomach against rocks, shells, or sea-plants. Some maintain that the young sea-horses, when frightened, go scurrying back to their shelter in father's pocket, but this is not proved. Pipefishes also have pouches and use them to protect their young. In one species the female has the pouch and carries the eggs and young; in other species the male is pouched.

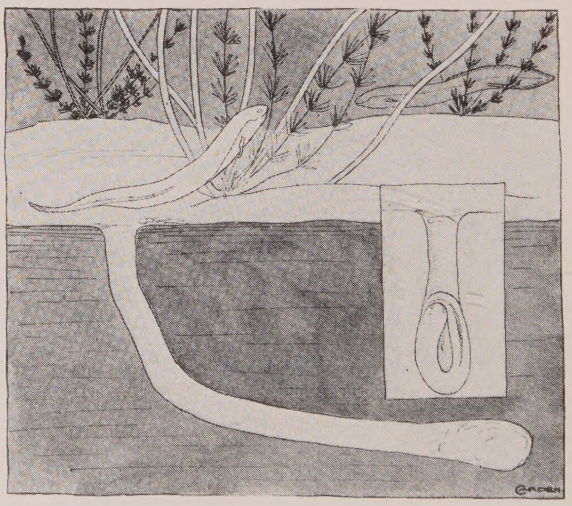
The toadfishes, gobies, and blennies lay eggs in empty shells, cans, or pieces of old pipe. The eggs adhere closely to them, and the male of the species is on constant watch until the eggs hatch.

Nest building by the fresh-water sunfish finds one of the parents, more often the male, fanning out a bare space on a sandy or gravelly bottom. After the female has deposited the eggs, he stands guard, fighting if necessary to protect his charge, but ever fanning the eggs with his fins to aerate them.

The male bowfin of North America, *Amia calva,* selects a seclusive place on the bottom among an abundance of aquatic herbage, persistently removes plants, weeds, and such by moving in a circle until the soft weeds and roots are crushed aside. Then he fans the ground by the movement of his body and fins. Even before the eggs are laid the male protects the new home. Of course, if the female deserts him he finally abandons the newly-built nest. A few days later, a male may receive a second female into his nest, but the female sometimes spawns in other nests, too. After the little fish have hatched the male continues to protect his swarm of young ones by circling around them and thus keeping them in a body.

For bigger and better ideas of housing, however, the female salmon rivals most species. After scooping out a nest about a foot deep in the gravel, the female salmon enters this trough-like home to spawn. After the male has fertilized the eggs, the female covers them with gravel, using her tail as a shovel. Yolk-sacs provide nourishment for the fry for a month or two after hatching. Thus they can get a "head-start" while under the protection of gravel a foot deep. Otherwise, a larger number would not survive the various hungry mouths waiting for tasty little salmon as a dinner tidbit.

MALE SEA-HORSE RUBS ITS STOMACH TO GET YOUNG OUT OF POUCH. ABOVE IS EGG CASE OF A SHARK



THE LUNG-FISH MAKES A BURROW FOR ITS EGGS AND ACTIVELY GUARDS THE ENTRANCE. INSET SHOWS MANNER OF HIBERNATION DURING DRY SEASON

The eggs of the lump-sucker, *Cyclopterus lumpus,* are attached to rocks, shells, or other objects in masses and guarded by the male, who, by the action of his fins, keeps the water moving over the spawn to aerate them. But he is not through with his parental job when the young fish hatch. The young lump-suckers receive further protection from their vigilant parent by being tied to the proverbial apron string. By means of their suckers the young fry cling to the body of Mr. Lump-sucker until they can venture forth into their watery world.

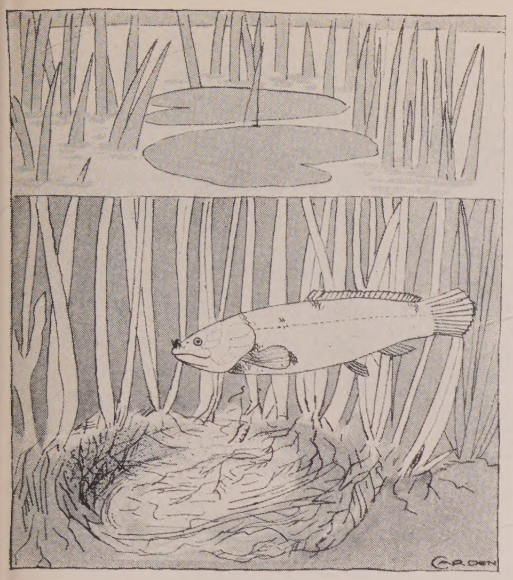
The butterfish or rock blenny, *Pholis gunnelus,* has a modern idea of the division of parental responsibility by arriving at a 50-50 basis. The butterfish rolls its eggs into a ball-like mass and coils around them, somewhat snake-fashion. The male and female alternate in this task.

Interesting is the South American fish that burrows into the ground when its pond becomes dry and remains in hibernation in its tubular nest, dilated near the bottom, until the rainy season fills the pond again. The lung-fish's idea of home life carries over into the protection of its growing family. At the bottom of the swamp this fish excavates an underground burrow with a four- or five-inch doorway. But Mr. Lung-fish thinks it must not be just an ordinary house or burrow! After descending approximately a foot this hallway becomes horizontal and varies in length from two to five feet. With his young in this miniature dungeon, the male remains on guard in the burrow or near his doorway.

Relatively few fish protect their eggs or young, but among those that do, one finds the male more active than the female in this duty. In vindication of the female of the species, however, one hastens to call attention to a species of catfish in which the female assumes responsibility for the care of her young. After laying the eggs, the female presses the under part of her body, which is spongy and soft, against the eggs. During the entire period of incubation, she carries them attached to her body.

The most disillusioning part of parental care by fishes is the fact that after the parents have carefully guarded their young they may lose this instinct after the period of protection is over and turn upon and devour them.

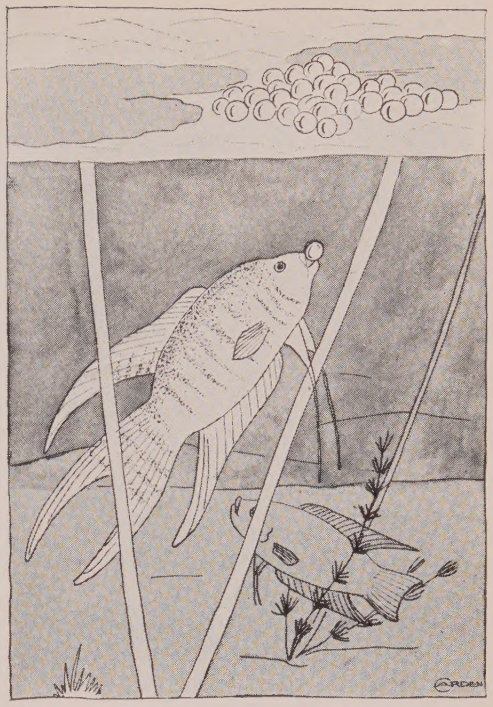
Nature has tried to provide for some fishes without



(LEFT) THE MALE BOWFIN CIRCLES OUT A NEST AMONG THE BOTTOM PLANTS

(RIGHT) THE PARADISE FISH PROTECTS ITS EGGS BY BLOWING BUBBLES AROUND THEM AND GATHERING THEM IN A MASS

(BELOW) THE BUTTERFISH COILS ITSELF PROTECTIVELY ABOUT ITS EGGS



instinctive habits for protecting their eggs in nests. The goosefish lays its eggs in a jelly-like substance that sometimes looks like a huge sheet some twenty to forty feet in length and about a yard wide. Some of the American fresh-water perch lay their eggs in long strings held together by gelatinous material, fastening these strings to under-water plants. Other fishes protect their eggs by attaching strings of them to plants to keep them from being buried in the mud. The skates lay their eggs in oblong egg cases about two or three inches in length. On each corner is a vine-like tentacle that is firmly attached to seaweed, the egg case rocking on the waves like a cradle.

Although a few groups of fishes seem to have developed special protective instincts, and although Nature has evolved other means of protecting eggs, only a small per cent of all eggs hatch and become adult fish. An individual fish, as in the case of the cod, may lay eight or nine million eggs a season, and with such prodigality Nature finds it impossible to provide for, or to protect, all of the young born in the seas. Those that seem to have developed some forms of protective instinct are merely adjusting themselves to a dangerous environment. All creatures, including man, have striven for security, but no species has fully attained it.

An Old Rail Fence

By E. F. HEYDINGER

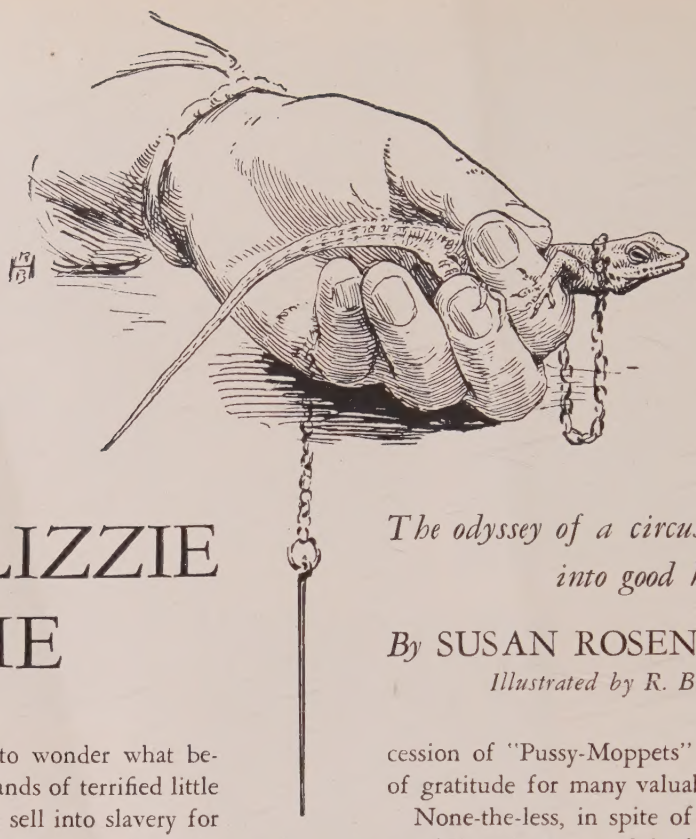
Your weather-worn ribs are sagged and broken,
  Your corners are ivy entwined;
Half hid by wild roses and brambles and posies,
  A riot of color and kind.

You angle along o'er new ground and wood,
  A highway for chipmunk and squirrel;
That lean-to old rail is a stage for the quail;
  There robin and red bird may quarrel.

You nurture the mullein and colorful thistle,
  The elder-bush sweet-smelling blow;
And here's a black berry and there's a wild cherry.
  There jack-in-the-pulpit may grow.

The winter's white flakes are garnered behind you
  In wind-blown billows and bows,
As an angel would trace with God-given grace
  For junco's repast and repose.

You once encircled the pioneer's cabin
  And marked each pasture lot line;
But as time turns its pages you pass to the ages
  In memory, picture and rhyme.



SEEING LIZZIE HOME

The odyssey of a circus lizard that fell into good hands

By SUSAN ROSENSTIEL POPOV

Illustrated by R. Bruce Horsfall

HAVE you ever stopped to wonder what becomes of all the thousands of terrified little lizards the big circuses sell into slavery for the amusement of children and the special perplexity of parents? The frightened creatures, dangling from their neck chains and ruthlessly cut from the board where they were pinioned in rows, are handed over, in the stifling noise and confusion of the circus tent, to strange new masters, boys and girls of all sorts—careless, cruel or too kind—with only the instruction: "Give 'em plenty sugar and flies."

What are their fates? Do most of them die, and, like all the useless pins of the world, sink back into the ground forgotten? Or do some of them, with a tenacity of life almost equal to a turtle's, leave behind tiny comic-tragedies of queer, outlandish little beings subjected to an alien world, where everything, even the sunshine, moisture, and temperature, is utterly unsuited to their natures? Most of them must have suffered cruelly as they dragged out their miserable existences.

Our own Lizzie had a happy end; and I am going to tell her story in the hope of learning the experiences of others, and, perhaps, proving that our case was not as exceptional as I think.

Pets have always been a stark problem to me. I took them seriously and I wanted the children to do so. I knew they must grow up with a proper love of animals. But here were we, in a horseless age, living in a small apartment in a downtown district with only a fourteen by twenty court for a back yard. The household, composed of three generations, held opinions diametrically opposed on this subject; Grandma at one end, the children on the other, and me in between, in a really tight squeeze sometimes. Dogs early proved impossible after two or three disasters, and for several seasons a single cat seemed the only acceptable compromise, and, indeed, to a succession of "Pussy-Moppets" I owe a lifelong debt of gratitude for many valuable lessons taught.

None-the-less, in spite of cramped quarters and adverse public opinion, I look back through the years and see that Robert has led me a merry chase after an endless procession of stray dogs, turtles, rabbits—both tame and wild—snakes, frogs, fish, and mice, once even a shapeless mud puppy. Helpless before his constantly reborn enthusiasm, I finally yielded and laid down as the only rule, that pets to be had must be well cared for, fed, and cleaned. Whenever that failed, as, I am sorry to confess, I knew it inevitably would, sooner or later, they must go, either to some new aspiring owner who promised greater constancy, or back to their natural habitat.

That particularly hot August afternoon I was in no receptive mood. I had just returned from dumping off the bridge into the muddy waters of Yellow Creek a mess of ten languishing tadpoles. I had repeated to myself once again, and firmly: "Absolutely no more until he learns what responsibility means!"

But Aunt Mary had invited them to go to the circus; and, at five, when they returned, I despaired to see Bob proudly displaying our newest pet. I could have accepted cotton taffy, peanuts, or even those awful toy monkeys; anything, in fact, except pink lemonade or a live lizard. But there she was, a pitiable little unhuman thing, colder than a snake, but with a great metal chain around her neck.

Nothing to do now but try to make her comfortable and happy as possible; to cut away the cruel tight collar that left its permanent mark on her frail neck. Bob scurried around to find a box for a home and Sis brought a whole tablespoonful of sugar and a huge supply of dead flies. Lizzie scorned the food and by next evening there was no indication that she had touched either the flies or the sugar. So Bob had gradually to learn that a living

fly was more attractive than a wholly killed one. Held lightly between thumb and forefinger, so that its wings could buzz, and its legs struggle, it became an object of fascination to Lizzie's little beady eyes. She would watch long and attentively, then suddenly her sharp little tongue would dart out. The whole transfer was so lightning quick that I never could trace the passage to her mouth. That was real fun, and as long as the supply of flies was plentiful and the weather stayed warm I did not have to take a hand. However, even in those early days, the number she took was so pitifully small that we wondered how she kept alive, and we never saw her try to touch her sugar.

Her frequent changes of color, as she moved about from one background to another, were an unending source of interest. She could go from green to purple-brown, or dull brownish-gray, at will.

Twice during September and October she escaped from her box. Once she was gone three days, and finally turned up on the springs of Sister's bed. The second time she was away full five days and I was in constant terror of coming upon her chill little body in another untoward place. When we recaptured her at last, she was calmly blinking in a patch of weak sunlight upon the window ledge of my bedroom, a distance fully thirty-five feet away from her house and three feet above the level of the floor. From this expedition she was the worse for wear; her little left hind foot seemed to have been stepped on and crushed almost flat; and, if she had looked frail before, she now seemed almost dried up and ready to blow away. That adventure was succeeded by dark cold days, and Lizzie remained quiet and listless and seldom ate, no matter how tempting the wriggling bait. The children were occupied in school; flies were few. So I had to begin my real job of nursing.

I would often take her up in my hand and the frail little waif actually seemed to find satisfaction in snuggling down on my wrist in the shelter of my cuff. Once in a long time I could cozy her up, if the sun was bright, to the point of eating a little food. But that was seldom indeed, and as it grew more wintry she ceased eating altogether. Her skin wrinkled all over and looked like gray wasp paper.

One morning she appeared, especially frayed out and ragged. Carrying her to the window, I saw, to my surprise, that she was shedding her skin. A tiny split in the center of the back had enlarged until, right before my astonished eyes, her head and shoulders were pushing out. For three days it lasted, and the children were as fascinated as I with the process. Finally it became evident that the cast skin was hopelessly stuck on the injured hind leg, and I had to perform a tiny bit of surgery to free it. Can you imagine what fairy gossamer that tiny shed garment was like? In comparison with it the casting of a cicada, which one so often finds in late summer, seemed like a heavy coat of mail.

The new skin somehow looked brighter and greener than the old, and the little creature bravely perked up and ate a bit, as if to make a new start, even in these adverse conditions. Then it was I had an idea, and made a solemn resolve. If she had the courage to bob up that way, I would try to help her get back to her tropical home where she could be really happy and live as a lizard should. In fact I would conduct her there myself. That date was October twenty-fourth, and I was then hurrying to get the family packed in order to reach Florida before winter struck.

I made Lizzie a little traveling cage from a long, narrow pen box, with a large round piece of hard candy fixed firmly in one end for a pantry. I pasted in a tiny water pan in the middle portion, because I never could rid myself of the idea that she should drink water as most other live creatures do. Then I made a softly-lined sleeping com-

partment in the other end, and punched generous holes for ventilation. All this elegance I gave into Bob's proud keeping for the journey.

As we rolled down through Indiana the first day out, Lizzie served as the best possible amusement for the children; she stretched cosily on their hands in a patch of warm sunshine and actually once consumed a mosquito. The slide door of her cage had to be opened and shut constantly to be sure that the candy store was still in place.

In Berea, where it was raw and chilly, there was too much of other interest for much attention to be paid poor Lizzie, so that when I finally looked at her next night after we had landed high in the frosty Carolina mountains she was nearly dead. We ourselves were almost congealed with the cold, and, since we had arrived so late, we could not be accommodated in the main part of the old hotel but had to take refuge in one of the flimsy summer cottages, where a small, bright-eyed Negro soon appeared to kindle a fierce pine fire in the old sheet-iron stove. This served only to make a brave ruddy glow, but no sign of warmth beyond a two-foot radius in that bleak, frozen atmosphere.

In other circumstances this lovely old southern hostelry would have been a delicious experience, the quaint dining room with its great bunches of bright euonymus berries; the two maiden sisters who were the owners; the piping hot supper of beaten biscuit, ham and chicken; the ancient black cook; all these I saw and noted through a darkening haze because Sister had suddenly fallen sick (not ill) and I could not be sure that it was nothing more menacing than simple car sickness. All throughout the night I tried vainly to get her warm with all the blankets and clothes I could command.

Followed a marvellous hospitable breakfast, which, sad to remember, was completely lost on me, with Sister, pale and drooping at my side, not able to eat a bite, and having to leave before it was over. It was no wonder then, when we were at last fully five miles out on our wretched way, that I discovered Lizzie's box had been left behind. I thought hard for a minute, scanning Sister's wan face; but I remembered my solemn resolve, and I doggedly turned around, only to find Lizzie frozen stiff on the mantel shelf. Anyway, I picked up the box and took it along, grimly remembering that the children always loved a funeral.

The next morning at Lake City, things generally seemed happier. The sun was gloriously bright, and we could open the windows to let in the delicious pine air. Nearing Orlando, I asked Bob to get Lizzie's cage and told the children we would make ready to bury her properly. Bob slid back the lid and peeked in, reluctantly. There was a loud shout: "Oh, Mama, she's alive and fine, and, see, she's eaten a great big hole in her candy!"

Sure enough, there she was, no longer a corpse, but an alert little live creature, such as we had never known before, quite ready to attend her own funeral. Some subtle elixir from that blessed tropical air had reached her, too, and made her over into a new being. Maybe the children didn't scour around then to catch the now abundant flies, and maybe Lizzie, herself, didn't gobble them all as fast as they were offered! I could have turned her loose then and there on the shore of that lovely little lake in the center of Orlando, with a free conscience, knowing that I had fulfilled my pledge. But I decided to wait until we had reached our real destination at Miami. I think I wanted to end up with a final farewell ceremony after all our vicissitudes.

That night we arrived so late that the children had already fallen asleep, and I tumbled them in on our own sheets without waking them. In the morning, to my dismay, I found that the former tenants had evidently misused the house and that I would have to boil the dishes before any of us could think of a decent breakfast. In the midst of this, a long wail from Bob, followed by one from Sister, brought me out on the porch in terror, and there I saw them both standing disconsolately looking up into a great umbrella-like tree.

"Mama," Bob cried, "I just took her out to feel the warm air for just one minute, and I put her on the branch of the tree, but I didn't let go my fingers a bit; but when I looked she was gone!"

Yes, little Lizzie was gone, vanished into thin air on the silver bark of that royal poinciana tree. So my story can have no climax; I am cheated of my farewell. By now, I am reconciled, because the whole experience seems the more perfect to have had her own environment surge up thus irresistibly and carry her off on a wave of joy. I was a nurse in the Great War, and I have been accorded my share of compensation for personal service rendered. I have nursed homesick recruits in Georgia, I have stood beside boys dying of flu at Camp Merritt. I have made a home out of a dreary ward in the S.O.S. Hospital in La-Rochelle, and I have given plain American comforts to Polish soldiers at Pulowy. Yes, I have had my downright satisfactions in life; but I have never felt a greater glow than that from seeing the little lizard safely home.

Often during the remainder of that winter, I would lift the vines on the sunny plaster wall of our cottage, and watch the tiny lizards scatter gaily. Always I hoped to catch a glimpse of one that would lag a little and drag a left hind foot. Never that, but I used to think she laughed at me from behind the sheltering leaves.

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Volume One, Number Three of the American Nature Association *Quarterly Bulletin* is devoted to a report of studies on conservation education that have been carried on through Cornell University with educational funds of the American Nature Association. This bulletin is now available to all members of the Association on request, as are copies of Numbers One and Two, devoted respectively to a general discussion of conservation problems and to highway zoning.

Insect Samsons

By S. F. AARON

Photographs by John J. Ward, F.E.S.

As is commonly known there are many primal processes in Nature that have provided the ideas and inspiration for inventions by man. Far more than by all other creatures the arthropods have contributed to these creations. There are masons, makers of paper, community castle builders, carpenters, joiners, tentmakers, tailors, sailmakers, bridge-builders, tunnelers, well-diggers, utility kite fliers, aviators, stock raisers, agriculturalists and divers. That modern science and industry will make further use of methods developed millions of centuries back by our winged and crawling enemies and friends there can be little question.

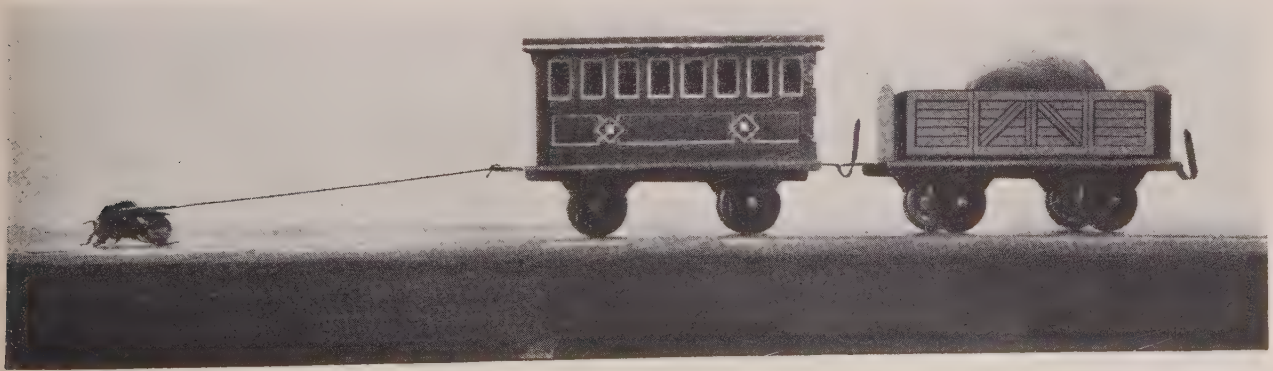
In the anatomy of these insects are forces not at all, or but partially, employed by man. Perhaps the most remarkable is the wonderful development of insect muscular control, which has no equal among other creatures, irrespective of size or weight. Instant action, speed of operation, strength in proportion to the extreme leverage of motion, and, particularly, the combination of two distinctly different applications of power, are notable.

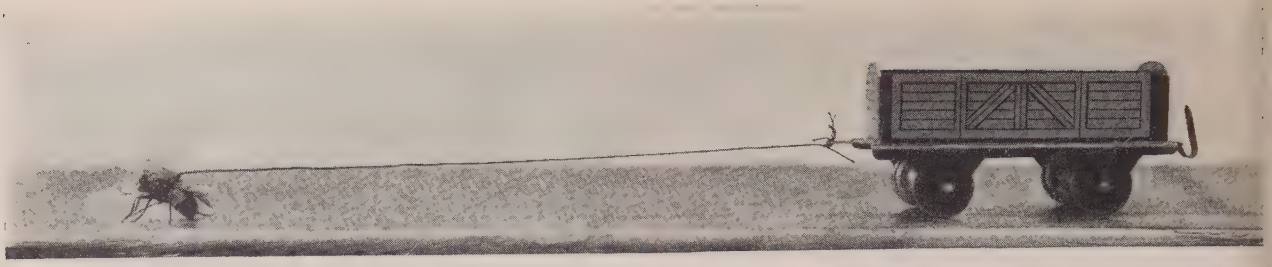
An examination of the muscles of insects discloses surprising facts. First, note those animals with endoskeletons (having backbones—the vertebrates), that depend for action upon a series of expanding and contracting fibers attached to the exterior portions of the encased bones and are thus self-contained. Then observe those having an exoskeleton (consisting of an external shell—the invertebrates), in which the muscles are in part attached to the inner, sectional shell of the opposing movable parts and operate independently by expansion against the outer shell where it is essentially pliable, thus forcing the members there attached into required positions.

In other words the arthropods possess two different kinds of muscles. One set is fibrous and of tensile strength suitable to pulling tendons. The other is an almost jelly-like mass that exerts power only by expansion within the

A GROUND BEETLE PULLS A LOAD 182 TIMES ITS OWN WEIGHT

At the top of the page an earwig is pulling 530 times its own weight, while, below, a bee takes on a trucking job 301 times its weight. This pulling power in insects is as remarkable as the flight power the author discusses





THE BLOW FLY PULLS A TOY CAR 170 TIMES ITS OWN WEIGHT

Below, a short-bodied dragonfly, suspended but with wings free, holds a loaded wooden barrel plug twenty times its own weight. It held on for more than ten minutes

external shell. Thus it operates the legs and wings attached to the external shell where the tegument is exceedingly tough and pliable. By this means there is exerted a far greater force than can be expected of any fibrous tendon.

When the two muscular forces act together, as in the femora of leaping grasshoppers, fleas, and leafhoppers, and the powerful trocanters, femora and tarsi of stout digging beetles, there is exerted a power beyond that of any unit of either kind. It will be observed, however, that probably without exception the wing muscles of insects are of the expansion type only, which indicates that the softer material is capable of more rapid manipulation. In other words the shifting from expansion to contraction, and the reverse, is far more subject to rapid action as required by wing motion than those muscles of the tendonous type. It is also apparent that the greater mass of these muscles give more power and instant action, for wing motion must be by far the most rapid and unfailing. Thus, also, it will be observed that the swollen parts of limbs where greatest strength is required possess these expansion muscles. The most rapid-flying insects, such as the bee-flies, the skipper-butterflies, the dragonflies, the sphinx and noctuid moths, the cicadas, and hornets and bees, have the stoutest bodies to accommodate these larger masses of expansion muscles.

Thus Nature has looked for an improvement over the tendonous muscles and has found it by a simpler and more easily developed means. The characteristic action of these muscles may be clearly observed by making cross sections of freshly-killed, heavy-bodied species. As the wings are placed in different flying positions under the microscope the attendant expansion muscles will show mass concentration at those points that control the wings.

There are no more remarkable developments in Nature than the wing motions of the rapid-flying insects. Mere strength is largely a matter of relative weight and size. Wing motion, due solely, perhaps, to the expansion muscles, is truly phenomenal in rapidity of action. The tuning-fork is the reliable indication of the wing stroke in time. But it is often best to add further proof to anything that savors, however slightly, of theory.

In order to establish beyond much question of doubt the truth of this rapidity of motion I constructed a spindle of wood the diameter of an andrenid bee's body—seven thirty-seconds of an inch. At each end of this spindle was a brass metal cone bearing, and midway a tiny pulley, in turn driven by a series of hand-turned pulleys from large to small and so proportioned as to give certain speeds. In the center of the shaft of wood there was firmly fastened by cabinet-maker's glue two opposite wings of an andrenid bee. When the spindle was revolved at a speed of 600 revolutions per second, it gave off a sound that was very nearly the same pitch as the wings of a flying bee of this species. This should be sufficiently exact. Except the song of some woodland mosquitoes, certain small black syrphid flies, the bee-flies, *Bombylius,* and several allies of the latter, no winged velocities that I know of give off these exceedingly rapid vibrations.

It may not be out of keeping here to note recent statements in regard to the flying speeds of insects and the writer cannot refrain from criticism. One noted scientist contends that the deer parasite fly, *Cephenomyia,* has been proved to fly more than eight hundred miles per hour, although for short distances. I contend that the speed of no bot, nor bee-fly can be correctly ascertained, and that a speed equal to a rifle bullet is impossible.

The eye cannot discern any difference in the get-away of a *Cephenomyia* and a *Bombylius,* the fuzzy bee-fly. Both are at once lost sight of. But when a bee-fly or an equally fast andrenid bee passes in a sun ray the glint on the body is visible and when it alights it may be identified. Under like conditions will the shine on a passing bullet be visible?

More Birds of Britain

By L. J. LANGFORD

In the rotogravure pages that follow, this article is supplemented by more of Mr. Langford's splendid bird pictures

IN SUNLIGHT, THE VIVID BLUE OF THE KINGFISHER'S PLUMAGE APPEARS ALMOST TO GLOW

To set out in a small motor-boat from the cliffs of Pembrokeshire over white-crested blue seas to the islands of Ramsey, Skomer or Skokholm is to admire the mastery of the air that seabirds have acquired. From yonder headland the herring gulls have been disturbed, and at that distance they resemble myriads of snow flakes as they fly back to their nests on the ledges of the cliff with barely any wing movement. Parties of puffins, guillemots and razorbills are flying towards the islands with rapid wing beats. Others are dotted over the surface of the sea. An occasional gannet, ever watchful for an opportunity to spear a fish by a swift nose dive below the surface, is gliding towards Grassholm, much of which is covered with nests. Then, one suddenly becomes aware of a little red falcon hovering over the land as if suspended by a thread from the clouds above. His wings move quickly and his tail is spread like a fan, but he does not alter position until he closes his wings and drops like a stone upon some small mouse or vole, in the grass below.

The power of flight in bird, bat and insect is to me a fascinating study. Birds so widely different as the curlew and night jar give striking aerial displays in courtship. Both species breed in sparsely wooded heathland and are not difficult to find in suitable localities. From the middle of May, the night jar's continuous "chur-r-r-r-r" may be heard after sunset at considerable distances. He is one of the latest migrants to arrive and his note is both penetrating and distinctive. It grows and diminishes in volume, giving an effect almost ventriloquial, so that it is difficult to say precisely from whence comes the nearly monotonous sound. Careful stalking may discover the bird perching along a dead branch of some pine or oak near some opening.

One may be fortunate enough to see the pair in love flight in the late twilight. The birds circle around each other with wings upraised, rather like huge butterflies in slow motion. The male claps his wings sharply over his back and utters a pleased "quoi-k" from time to time. It has been said that this clapping stroke is used to kill moths as prey, but I have watched the birds maneuver just above my head for twenty minutes, and doubt this theory. A week or ten days later one may almost tread upon the sitting hen before she flies from her two longish eggs, which are laid slightly apart and parallel on last year's bracken, or perhaps the bare sand of the dunes. In such situations the color and markings of her plumage constitute an example of protective coloration, a remarkable resemblance to a piece of dead branch from which the bark is peeling. The eggs are beautifully marbled with ash-gray and brown.

The curlew usually places her nest in the ample cover afforded by a tussock of grass or a patch of rushes, although occasionally the three or four large eggs may be found in a scrape or fallow. The hen sits lightly and runs from the nest at the slightest sign of danger or on hearing the alarm note "cour-lep" of her mate already on the wing. Young curlews are able to run within a few hours after breaking the shell. At this stage the parent birds are noisy and bold in defense of the young. I have seen them fly up to engage a kite that regularly quartered the marsh. It appeared to put all the birds nesting there in a state of

THE CHOCOLATE-HEADED GULL IS AN INTERESTING BIRD IN ITS BREEDING HAUNTS AND IN SEAPORT CITIES

panic. The kite gave an outstanding exhibition of aviation, a slow gliding in wide circles from horizon to horizon without a wing beat, from which perhaps his ancient name of "Glead" is derived.

Another interesting bird breeding in May and June about upland pools is the chocolate-headed gull. It is often called the "black-headed gull", *Larus ridibundus,* but at close range the hood is definitely a rich shade of brown. In winter, it is commonly found in British seaports, such as London, where on the Thames Embankment the birds are fed pieces of bread and table scraps. At this season the chocolate hood has disappeared except for a small spot immediately behind the eye, but, as January passes, the spring dress is gradually assumed. In April the adult birds flock back to their nesting haunts, often far from the sea. Nests are built close together on small islands and on reeds, flags or bushes at the water's edge. In dry seasons the nests are often left on dry ground from which the water has receded. Two or three eggs are laid and the young leave the nest soon after they are hatched.

It is delightful to see a kingfisher, *Alcedo atthis,* speeding like an arrow downstream. In sunlight, the vivid blue of its plumage appears almost to glow. It is perhaps the most brilliantly-colored British bird, its hue suggesting the tropics. One may be fortunate enough to see it perched on a branch or post overlooking a pool, intent upon small fishes such as bull-heads or minnows. It is not timid, and I have had it alight halfway along a ten-foot fishing rod held in my hand. When it is feeding small young, the prey is held so that the fish may be offered and swallowed head first. If it proves too large the adult will dip the fish in the stream repeatedly, meanwhile beating it vigorously on a stone until all the bones are broken.

The nest is a saucer of fish bones disgorged by the birds in an enlarged chamber at the end of a tunnel driven two or three feet into the river bank, usually at a spot that falls sheer to deep water. The tunnel is commenced about the middle of March. The excavated earth forms a tell-tale mound below the surface of the water unless the current is strong enough to wash the soil away. The eggs, usually eight in number, are almost spherical in shape. When fresh they are of a beautiful pink color, for the yolk shows through the delicate glossy white shell.

On one occasion I made a blind at a nest, and left it overnight. Within fifteen minutes after I arrived the next morning I had rearranged the blind, which had been disturbed by some young cattle, and had the camera focussed on the stone, upon which one bird alighted almost at once to give me my first exposure. Other pictures followed in quick succession, as fish are brought at surprisingly short intervals.

While watching the kingfishers from the blind, waterhens came by, swimming past the blind and wading over the shallows. The waterhen, often called the moorhen, is one of the rails, and has the typical feet of the group. The bird is able to walk on soft mud or even aquatic vegetation, or to swim to where the nest is built in a clump of rushes or sedge. Two broods may be raised in a season, as half-grown chicks are often seen in the vicinity of a second nest containing eggs.

Although one may sometimes be privileged in obtaining a good close view of a blackbird, it is an extremely wary subject. In fact its harsh chatter of alarm is often sufficient to warn every creature within hearing that man is in the vicinity. To overcome such a suspicious outlook on life, the hide must be moved into position gradually and it must be carefully camouflaged. One male was photographed immediately after he had fed the vigorous brood of five young. On previous visits to the nest his legs and breast had been quite wet from searching in the long grass for earthworms. He began his foraging as soon as it was light, but I was forced to wait until the June sun had penetrated through a dense ground mist. For an hour or so previously the light had not been strong enough to permit photographing the young, for the movements of nestlings are very rapid and jerky. It is extremely interesting, too, to see even blind chicks thrust up wide open mouths to the fullest extent of rubber-like necks as soon as the slightest vibration of the branches supporting the nest warns them of the return of a parent. How the adult birds know which one was last attended is a mystery, but the young are fed in strict rotation in spite of the fact that each mite strives its hardest to capture attention. (Continued in rotogravure)

The European puffin, *Fratercula arctica,* occupies the rocky shores of the North Atlantic and adjacent Arctic Seas from Maine to the British Isles, and the coat of Brittany. As in other puffins, the bill is ornamented in the breeding season by bright-colored horny sheaths. In autumn these are shed. In this species the base of the bill is grayish-blue, and the tip vermilion with lines of yellow. The birds nest either in holes of their own making, or in natural cavities.

The herring gull, *Larus argentatus,* here photographed on the western coast of England, is one of our most wide-ranging species. It breeds over much of northern Europe, western Asia, and North America, both on the sea-coast and on rocky islands and cliffs about inland lakes. In the winter this gull migrates southward from its summer home, now snow-bound, and spends the winter with its young, now dark blackish-gray, on the sea-coasts and about the larger lakes.

England, where this picture was taken, is fortunate to have retained the moor-hen or marsh-hen, *Gallinula chloropus,* in some numbers. This bird also inhabits suitable places in Europe, North Africa and Asia, and, in slightly changed form, much of temperate America. It is a modified rail, with some characteristics of the coots also.

The rails and the allies seem to be symbolic of the elusiveness and mystery of their watery haunts, and to be secure in their sufficient bounty. Sidney Lanier, in his beautiful poem "The Marshes of Glynn", seems to express some such sentiment in these lines:

"As the marsh-hen secretly builds
on the watery sod,
Behold I will build me a nest on
the greatness of God;
I will fly in the greatness of God
as the marsh-hen flies
In the freedom that fills all the
space 'twixt the marsh and the
skies."

The kestrel, *Falco tinnunculus,* occurs
some form throughout the more tempera
northern parts of the eastern hemispher
including certain of the islands. Rarely it h
wandered to Greenland and eastern Nor
America.

The kestrel has many of the habits of o
familiar sparrow hawk. It has the same hab
of hovering almost stationary in the air whi
seeking prey, and is called the "windhove
by the country people of England. Howeve
it is slightly larger than our bird, and diffe
in its coloration. It nests chiefly on cliffs or
recesses in old buildings, or in the abandone
nests of crows or rooks. It is interesting t
note that our bird, also, while most common
nesting in cavities in trees, occasionally r
sorts to buildings, cliffs, or even an aba
doned open nest in a tree.

The blackbird of the English country-sid
Turdus merula, is in form and habits almo
a counterpart of our familiar robin, and
seems strange that the emigrants from Br
tain did not recognize this kinship, and ca
our bird the red-breasted blackbird, or som
such name. It is interesting, also, that not a
our birds of this tribe are red-breasted, fo
in Central America occur some forms tha
are nearly all black.

The blackbird occurs throughout Europe
parts of northern Asia, and northern Africa
Its nest, as the illustration shows, is like ou
robin's, and it has the same strengthenin
mud-cup, and bluish-green eggs, althoug
these are freckled with spots of reddi
brown. Spotted eggs, however, are a com
mon variant among the thrushes.

The goatsucker of England, *Caprimulgus europaeus,* also called the night-jar and fern-owl, a bird typical of a family of almost world-wide distribution, owes most of its names to a medley of curious beliefs. *Caprimulgus,* of course, is in allusion to the ancient European superstition that the birds secretly milk goats under the shadows of night. Not only in the generic name, but in the vernacular name of the family, and its scientific term, Caprimulgidae, is this idea perpetuated. Night-jar is in allusion to the monotony of its night-long serenades. Fern-owl, of course, has relation to the habitat of the bird, in copses close to the ground.

The night-jar looks much like our own whippoorwill, and its manner of nesting, and its eggs and young, are similar. Some of our own people, of course not bird-lovers, think the monotony of the note of our bird entitles it to some name hinting of sleep ruination.

The European curlew, *Numenius arquatus,* which nests throughout northern Europe and western Asia, is the only one of this group that breeds in England, excepting the whimbrel. It leaves in winter for the countries about the Mediterranean.

The notes of most curlews have a certain resemblance to *courlie,* or *curlew,* and for ages its voice has given the bird its name in many languages. It is needless to say that this fine bird, still persisting in crowded England, is much loved by bird students of that country. The fact that any still remain is proof of a zeal for bird protection that might well be emulated in many countries, including our own.

The Life of A Waterspout

Waterspouts are tornados over water. They are fairly common, probably hundreds occurring every year, but they are not common to the individual observer. Many sailors have never seen one. The waterspout pictured here was photographed over the Gulf of Mexico by William J. Evans. We see it forming, fully-formed, weakening and finally collapsing in the middle.

In the Middle Ages waterspouts were generally believed to be living creatures. The name "dragon" continued to be applied to them long after this belief was dispelled. Even as recently as the last thirty years it was common for seamen to try to send a cannon-ball through one in the belief that this would break it up.

A waterspout forms at cloud level with a vortex in the atmosphere. This is caused by two streams of air flowing in opposite directions, or at different speeds. This conflict starts the rotation. The air in the vortex cools by expansion, and water vapor condenses to form a funnel-shaped cloud. Whirlwinds that start on the surface of calm water are not true waterspouts. A waterspout may be vertical or may incline at various angles.

Since the water in a waterspout is condensed from the air, it is always fresh water. It is not sucked up from the ocean and then dropped in a deluge when the spout collapses. Much ocean spray, of course, is churned up at the base of a waterspout. But unless a ship is close to this base the water that falls on it from a waterspout as it breaks will be fresh.

THE CHAMBERED NAUTILUS

This is the ship of pearl, which, poets feign,
Sails the unshadowed main—
The venturous bark that flings
On the sweet summer wind its purpled wings
In gulfs enchanted, where the siren sings
And coral reefs lie bare,
Where the cold sea-maids rise to sun their streaming hair.

Build thee more stately mansions, O my soul,
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length are free,
Leaving thine outgrown shell by life's unresting sea!

Oliver Wendell Holmes

SHELLS OF SEA AND BEACH

Photographs by Hiram Jefferson Herbert

Some of the glamor that has come to be associated with the chambered nautilus dates far back, for the ancients conceived this pearly shell as furnished with a filmy sail, and riding the waves before the winds. As a matter of fact, the owner and builder of this shell is an animal belonging to the class Cephalopoda, which includes the squids and cuttlefish, those dread creatures of the entangling arms. Most of these have a more or less developed internal shell. Such is the cuttle bone of commerce, a calcareous leaf-like body from *Sepia,* the cuttlefish. Squids vary in size from tiny species only an inch long to powerful and dangerous creatures that measure fifty feet over all. Such a giant may have the temerity to attack some of the smaller toothed whales, but is usually overcome and devoured. Other smaller squids are the common prey of seals and sea-otters.

The species here shown, *Nautilus pompilius* and *Argonauta argo* (treated on a succeeding page), represent the two sub-classes of Cephalopoda that have external shells. The fabricator of this exquisite shell lives in the outermost of the chambers. As it grows larger, it seals up the shelter just occupied, and adopts a new one. Thus the many-chambered shell is gradually formed.

In the illustration a cross-section of the shell is shown, the main chamber being the one occupied, and the closed chambers those successively abandoned.

Venus Comb, ***Murex tenuispina.*** This queer shell is an inhabitant of the western Pacific about the coasts of China, Japan and the Philippines. It is not a rare species, but is difficult to obtain uninjured because of the delicacy of the spines, which are easily broken by the buffeting of the waves in its watery home. It is here shown about natural size.

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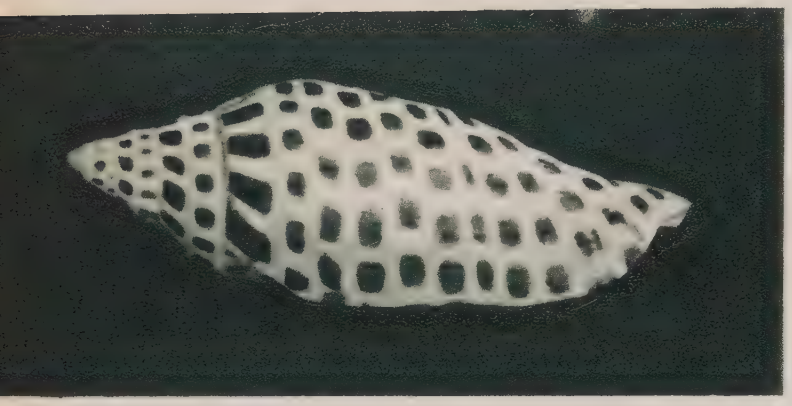

Scaphella junonia (formerly known as *Voluta junonia*) here shown about natural size, is an inhabitant of the Florida Keys and other parts of the Gulf of Mexico. It is usually found in from ten to twenty fathoms, and is sometimes brought up by the sponge divers. It has been known for nearly a hundred and fifty years. Formerly an unusually fine specimen might bring as much as fifty dollars, but they are now worth much less.

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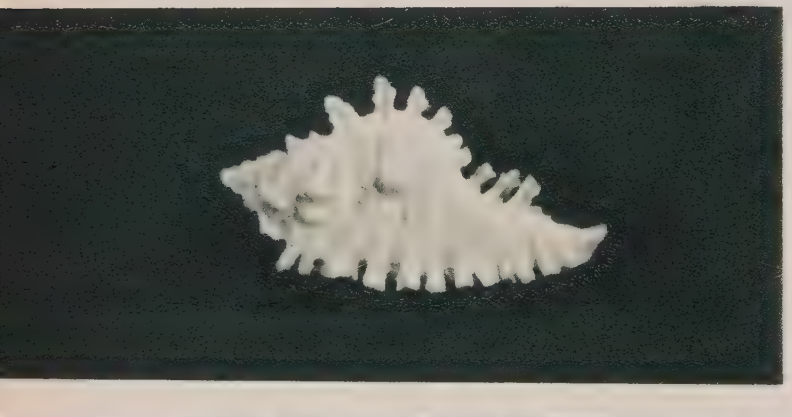

The Black Lace Murex, ***Murex rufus,*** here shown about natural size, is found at varying depths along our coast from North Carolina to the West Indies. It seldom exceeds three inches in length. Its surface is beautiful and intricately sculptured.

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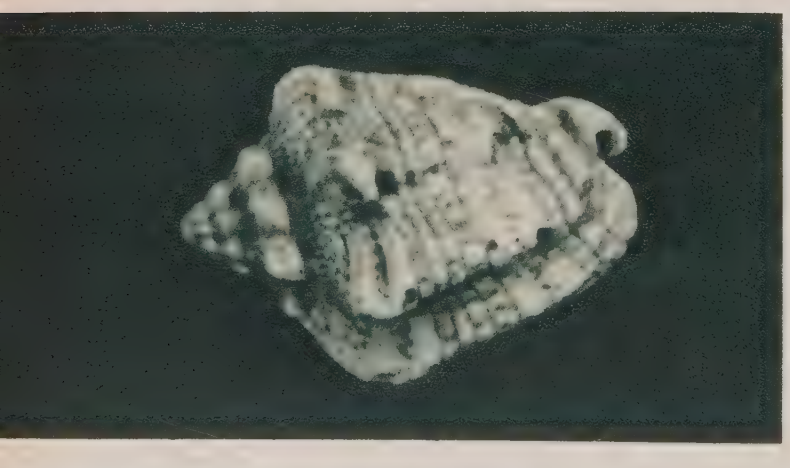

Voluta musica is here shown rather above its usual size, although specimens up to three inches have been found. Its name comes from its markings, which in some specimens resemble music script.

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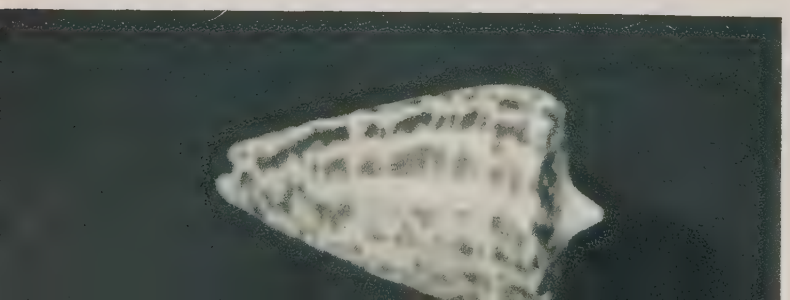


The Alphabet Cone, ***Conus proteus,*** ranges on both coasts of Florida and through the West Indies. The markings around its circumference give it its common name. The usual range in size is from two to three inches.

The Trumpet Shell, *Charonia tritonis nobilis,* a form of a common species of the South Seas, inhabits the waters off Florida and the West Indies. Its south Pacific relative, formed into a horn, has long been imported into many parts of the world, and has been employed to rally the clans of many a primitive or semi-civilized race. This is probably the "wreathèd horn" that Wordsworth, wearied with civilization, wished that he might hear old Triton blow from his haunts in the tempestuous sea. Many others have echoed his wish.

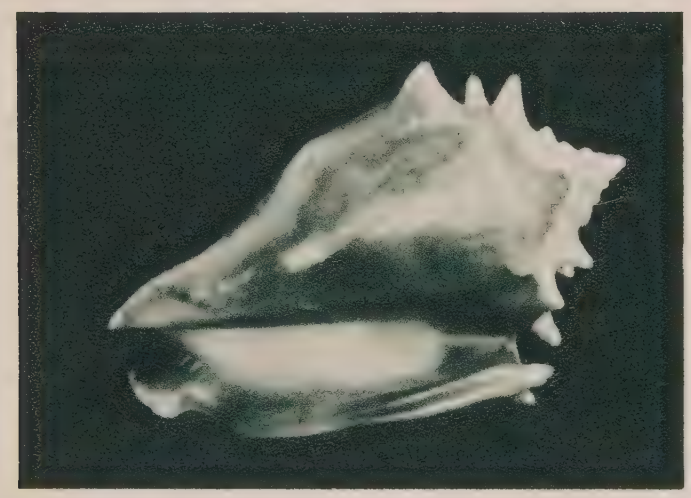
Hippopus maculatus ranges in most of the waters of the Philippines and other parts of the western Pacific. It is a rather heavy shell from three to nine inches in length. At some periods it has been shipped in great quantities to various countries for sale as ornaments.

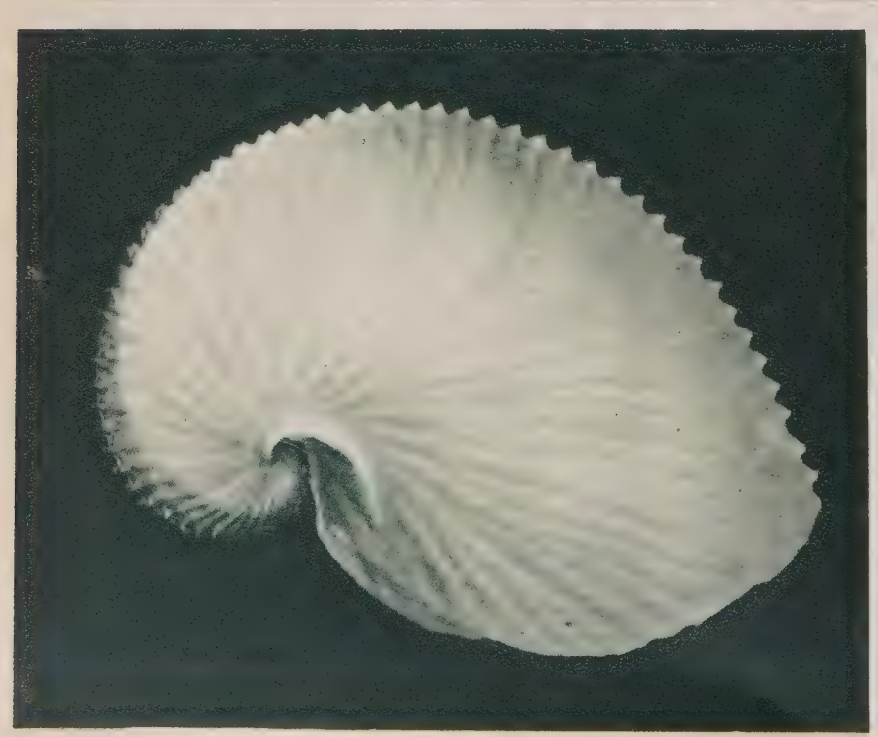
The Princess Helmet, *Cassis flammea,* is a rather common species on our southeastern coast from South Carolina southward, and is generally distributed in West Indian waters. It commonly runs about four inches in length. It is smooth in texture and is less subject to incrustation by its shelly parasites than many of its relatives.

Pecten is almost cosmopolitan in range, so anyone who has walked on a sea-beach is likely to have seen some one of its numerous species. The striking pattern lends itself to mural designs, and appears in many armorial bearings and other insignia. These shells are able to move about to some extent by opening and closing the valves, but some have a byssus, and attach themselves to some stationary object. This one, shown about natural size, is *Pecten nodosus*. It is found about Florida and the West Indies.

Strombus pugilis, the Fighting Conch, (left, below) has received this name because of its surprising activity. A captive individual will sometimes escape over the sides of a boat. It is especially common on the gulf coast of Florida, and about the Keys, as well as about the West Indies.

The helmet shells, Cassidae, are carnivorous, living on their less active cousins, the bivalves. As a group they are widely distributed. The one here shown (below), of moderate size, is *Cassis strigatus,* of the north Pacific.





The Paper Nautilus, *Argonautus argo,* is one of the best known representatives of the order Octopoda. Like its chambered cousin, it was long supposed to sail the seas, and so was given its classical name. There is only one species, almost cosmopolitan in range. Only the female has the shell, and this is secreted and held by the membranous expansions of the extremities of two dorsal arms. This beautiful and delicate shell holds the eggs, and the mother retains it until they hatch. The delicate translucent shell is then discarded, and sometimes may be washed up on the beach. The membranous expansions, after the laden shell was released, were probably the "sails" by which this creature was able to perform its mythical voyages.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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MORE ★ ★ ★ SANCTUARIES NEEDED ★ ★

In times of changing economy and social structure, such as the world is now enduring, many words and phrases lose clear-cut definition, and new ones, sometimes ill-defined, appear. Such a word is "sanctuary". In its original sense a sanctuary was a place held sacred to a certain act or office. Because of various circumstances the original meaning has become so modified that, even as restricted to apply to wildlife protection, the dictionary definitions are somewhat uncertain. Let us, therefore, ignore them for the moment and reflect that, since wildlife, generally speaking, reached its maximum known abundance in spite of its natural enemies (or, perhaps, because of them) it is still able (within reasonable limits) to contend with the wild foes. And since wildlife in almost all cases owes its diminution to the action of man, it follows that what wildlife most needs is sanctuary from man, and from enemies introduced or encouraged by man.

Many different methods have been tried to give our wildlife such protection. We have had innumerable areas dedicated to their use. The earliest were preserves in which no one except a monarch and his retainers could hunt. When our country was settled by liberty-loving people, the desire to share alike in Nature's bounty upset this system. But with the diminution of wildlife that came with intensive settlement, there crept in the principle of retaining for a favored class the major share of the wildlife that, of course, belongs equally to all. This principle has never been entirely divorced from our practices, and it is this form of selfishness, and the greed of commercialism, that have led in a great measure to the ambiguity of terms now in vogue to denote various types of refuges. So it has come about that so many kinds of areas are now set aside for wildlife purposes. Latterly it has become the fashion to herald their establishment and improvement with a tremendous amount of publicity, evidently to spread the impression that all is well with our wildlife. And yet—*the wildlife of North America still urgently needs more and better refuges—it needs more sanctuaries.*

We have for waterfowl every gradation of refuge from the baited pond where ducks are scared up and driven before the hunter, at so many dollars per bag-limit, to the actual inviolate sanctuary that is well suited for duck resting and feeding, and where no shooting whatever is practiced. But whatever its merits or faults there will be some one to call any such area a sanctuary. One type of "sanctuary" popular in states where the money for protecting wildlife is derived from the sale of hunting licenses is an area enclosed by a brushed strip and a strand of wire. On this line of wire are signs denoting that the enclosed is a sanctuary and that trespassing is forbidden. The remainder of the property is open to hunting by the public. Whether the area enclosed be large or small (and in some cases an area as small as two acres is deemed sufficient), the harassed birds are expected to learn by education and experience that they are safe within the wire.

Needless to say that this type of sanctuary is not the kind that is advocated by the American Nature Association; neither is even a "super-sanctuary" if part of its area is open to public shooting.

For some years the American Nature Association has advocated the establishment by associations and individuals of wildlife sanctuaries of many kinds, and of all sizes. A few of the States have such sanctuaries, and cooperate in their management in various degrees. In most of the States, however, there seems to be no special machinery to assist those who wish to establish real sanctuaries. Indeed, in the case of some States one is forced to conclude that there exists a sort of unwritten regulation against inviolate sanctuaries. We are forced to this conclusion by the lack of success that has attended many sincere efforts by individuals and associations to set aside areas where all wildlife would be given absolute year-long protection. It is

almost the unvarying rule that requests from individuals for cooperation in establishing and maintaining such sanctuaries are ignored by state authorities.

We have intentionally mentioned no individual, association, or state either in praise or blame; there are, of course, examples of all these that will occur to the informed and interested reader. What interests us at the moment is the building up of a sentiment more favorable to the establishment and maintenance of sanctuaries of the type that we trust we have defined. Be assured that our wildlife needs these, many of them, not only for what life the areas themselves may save and protect, but to help in the upbuilding of sanctuary-consciousness among our people.

Our wildlife needs more sanctuaries!

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HELP NEEDED ★★ TO CONSERVE ★★ DINOSAUR TRACKS

North of Holyoke, Massachusetts, on the bank of the Connecticut River, is a red sandstone ledge, seven acres in area. It is not an ordinary ledge for it holds within its ancient rock the record of prehistoric animals that trod across it more than one hundred million years ago. The tracks that these former inhabitants of the Connecticut Valley left behind have been described by Roy Chapman Andrews of the American Museum of Natural History as "the finest dinosaur foot-prints in America".

Flood waters had played havoc with the roadbed of the Boston and Maine Railroad. In the work of rehabilitation engineers came upon the pre-historic tracks, which range from the hardly-discernible prints of small lizards to the eighteen-inch track of a great dinosaur. Paleontologists place these tracks in the Jurassic and Triassic periods, and hail them as a find of great value.

Massachusetts is fortunate in having a group known as The Trustees of Public Reservations. This is a private organization with a public interest. It is supported entirely by contributions, bequests and endowments in its work of preserving from exploitation and for posterity places of notable scenic, historic, or natural history value. Where a State, or a lesser political sub-division, must act slowly to conserve such areas, such a group as this is able to muster its forces in an emergency and to step in before it is too late, holding a valuable area by option or agreement.

To the end that this discovery might be preserved from exploitation privately, or the layers of the ledge quarried and taken away, the Trustees of Public Reservations stepped in. The railroad aided by displaying some of the prints to make the public "dinosaur conscious". Through the generosity of Mrs. James J. Storrow, half of the purchase price of five thousand dollars was obtained for the conservation of the area. The balance is still to be raised, and the Trustees are seeking contributions to insure the perpetuation of this valuable reservation. Here is a conservation opportunity in a specific sense of the phrase.

SUCH ANIMALS AS THESE IN TRIASSIC TIMES LEFT THEIR FOOTPRINTS IN WHAT IS NOW MASSACHUSETTS. ILLUSTRATION BY G. HEILMAN IN "THE ORIGIN OF BIRDS"

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The Need For Conservation

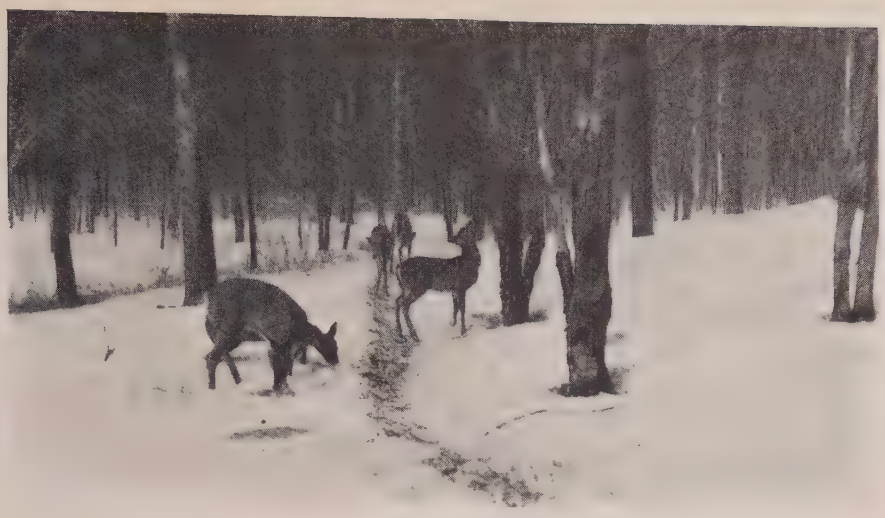
By AGNES L. SCHMIDT

The land is bleak and barren,
No pines nor oaks are seen;
The wind sweeps o'er the landscape,
Where pastures had been green.

The farms were once productive;
Where virgin soil was tilled
The earth is now eroded,
And plants and trees are killed.

The valleys are less fertile,
The pastures over-grazed;
The wooded slopes were slaughtered
That corn and wheat be raised.

And why has Nature suffered
This dreadful desolation?
Because man hasn't seen the need
For planning conservation!



DEER TRAIL IN STATE FOREST GAME REFUGE
Deer population has increased through protection and many find sanctuary when the season is open

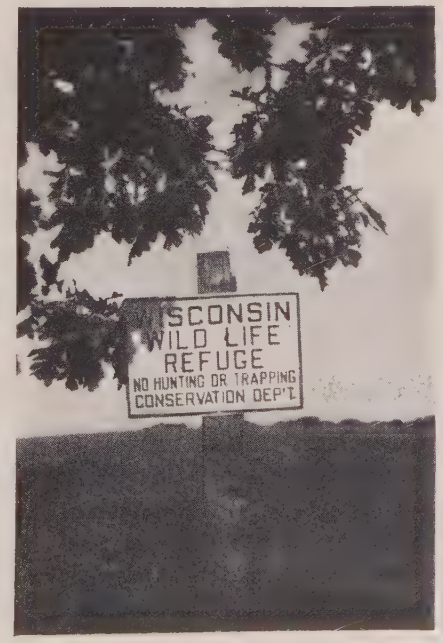
WILDLIFE REFUGES PAY

Wisconsin system proves the value of sanctuaries

By W. E. SCOTT
Superintendent, Refuge Section, Wisconsin Conservation Department

WISCONSIN has at the present time more than one hundred and fifty game refuges and sanctuaries for waterfowl, big game, game birds and fur-bearing animals. These units, which include more than 500,000 acres of land and water, constitute one of the most comprehensive programs of wildlife protection in the middle West.

Although many of these areas are specifically established to save the seed stock of resident animals, migratory aquatic birds also find them convenient sanctuary. This is evident from a recent survey, which found that one hundred and forty two lakes and two hundred and sixty miles of rivers and streams are included within the refuge boundaries. Besides this, the United States Biological Survey's Upper Mississippi Wildlife and Fish Refuge extends over about two hundred miles of Wisconsin's western boundary, giving additional protection to migratory waterfowl as well as to resident fur-bearers.



The full meaning of this refuge and sanctuary program cannot really be expressed in figures. Of course, by far the larger part of the state is open to hunting in stipulated seasons. The importance of the program, however, rests in the fact that on all state refuges no gun of any kind may be carried, unless it is knocked down or unloaded and enclosed within its carrying case. Moreover, trapping of any kind is strictly prohibited. In this connection it has been gratifying to note that hunters and trappers respect these refuges unusually well.

As some of these areas have been under this type of protection for more than fifteen years, wildlife population has increased in these localities until it has actually created a food and damage problem. Among the resident species, deer, beavers, muskrats, pheasants and rabbits have responded most readily and increased by such protection. It is found that these animals overflow into the surrounding territory and afford a continual source of supply. Of importance is the fact that animals find refuge quickly during an open season. For instance, after an open season on forked-horn bucks, the population in a deer refuge will have increased to twice the number of deer outside, and also have twice as many bucks or more. Pheasants and ducks are found to stay in a refuge, even if shooting is in progress less than one hundred yards away.

In addition to its own state program, Wisconsin has cooperated with the Federal Soil Conservation Service in the establishment of the Coon Creek refuge for upland game birds.

DEER FEEDING STATION
Food is provided, however, only when conditions are such that emergency rations are essential

This assures a prolonged closed season on about 100,000 acres of land in southwestern Wisconsin. Similar cooperation with the U. S. Forest Service has maintained the Nicolet and Chequamegon National Forests, which include more than two million acres of land and water, as refuges for fur-bearers through prohibiting all hunting and trapping for those animals within these units. This arrangement has been in effect three years, with the result that there has been a marked increase of fur-bearers in these vast wild areas of the state. In fact, wolves also increased so rapidly that it was found necessary to open the season on them during a short period each year to reduce their numbers.

Experience with these protective measures has proved the refuge and sanctuary program to be the most valuable and dependable method of increasing wildlife. Wisconsin is, therefore, planning to extend its system with the addition of numerous small sanctuaries especially for pheasants and muskrats. It is found that each year the population of these resident animals is materially reduced by hunting and trapping. To prevent this, sanctuaries as small as forty acres in extent are being established in areas affording the best cover to assure the saving of sufficient breeding stock.

Thus it is evident that Wisconsin has taken definite steps to protect and maintain its wildlife resources. With one hundred and forty lakes and two hundred and sixty miles of rivers and streams in refuge, migratory waterfowl and the resident deer, beaver, muskrat, mink and otter have found many gun-less and trap-less areas. Of sufficient significance also is the protection of fur-bearing animals in the National Forests, for these animals have for hundreds of years suffered from the steel trap, the deadfall and the snare. Now they can live and multiply to fill vacant territory with a maximum population. In this regard there is more that can be done, and more that will be done, but this is at least a foundation in protective management that is worthy of mention and proof of conservation progress.

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Nature Preserves A Duck's Nest

By MYRTLE J. BROLEY

A WILD duck has many things to battle before she hatches her ducklings safely. Crows or skunks may eat the eggs; marsh fires, sweeping across the dry reeds and grasses, destroy many nests with their eggs; cold, blizzards, too much rain, all are hazards. Surely no duck, however, ever met with harder luck than to have eggs and nest turn to stone!

This sub-fossil nest was picked up by a farmer at Ebor, Manitoba, a little place between the two large northern lakes, Manitoba and Winnipeg. All the water in that district has a high mineral content, and any object left long in such water is soon covered with a calcite deposit.

We cannot be sure what caused the submergence of this nest. Perhaps beavers built a dam and flooded the low land where it was. The eggs must have been well incubated, at any rate, else they would have floated away. A peculiar feature is that all six eggs are deeply pitted, giving them a most attractive appearance.

To what species of duck the nest belonged we can only surmise. What we do know is that it makes a most interesting specimen and we are glad that Nature has fixed it in this way so that it will endure for ages.

Things to Think About

Four very pointed and pertinent questions are asked in the *Monthly Bulletin* of the Oklahoma Game and Fish Department under the caption, "We Should Like to Know". It is to be hoped that the Oklahoma Legislature will supply the answers—and soon. The questions are:

When will Oklahoma establish in her laws some protection from rabbit trappers who, year after year, are depleting Oklahoma's supply of cottontails, trapping them by the hundreds and shipping them to eastern states?

When can Oklahoma expect a system of civil service for game law enforcement officers, thus freeing herself from political fetters which are in no way helping to increase and hold at par her supply of birds, animals, and fish in forest, field and stream?

Why can some permanent cure not be effected and restorative measures taken for the miles and miles of streams which have been devastated of fish and other life by oil, salt water, and in some instances mine pollution, in Oklahoma?

When will Oklahomans realize the great value of their fur-bearing animal crop and demand that more stringent laws be adopted to protect several species which have become alarmingly scarce in the state?

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Fort Tyler Migratory Bird Refuge on Gardiner's Island off the north shore of Long Island, New York, and West Sister Island Migratory Bird Refuge at the western end of Lake Erie, have been added to the list of migratory bird refuges. Both are located on the flyways of ducks and geese. The former comprises fourteen acres and has long been a favorite spot with bird students because of the number of ospreys nesting there.

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Net receipts from the 158 National Forests totalled $4,608,853 during the fiscal year ending June 30, 1938. Timber sales accounted for $2,435,000 of this, while grazing permit fees yielded $1,636,000. Special use permits accounted for $364,000. Thirty-five per cent of the net receipts are returned to the local communities. Twenty-five per cent of these returns go directly to the various states to be expended as the state directs for the benefit of public schools and public roads in the county or counties in which the National Forest is situated.

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Hunting on private lands embraced within the boundaries of Lassen Volcanic National Park is prohibited by law and by the terms of transfer of this Park to the jurisdiction of the United States, according to the office of the solicitor of the Department of the Interior. The Attorney General of California had contended that state game and fish wardens had jurisdiction over hunting and fishing on these lands. It is held, however, that the Act of Congress by which the United States assumed sole jurisdiction over the Park includes control in every particular except the right of public encroachment. California laws, except those relating to process-serving, taxation and voting, are held to be inoperative within the Park.

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The most unsightly and destructive quarry now marring the beauty of the highlands of the Hudson River and the Palisades is that on historic Mount Taurus. Its owners, the Hudson River Stone Corporation, are also cutting away a beautiful promontory at Little Stony Point, almost opposite West Point. A commission appointed by the Governor of New York recommended the purchase of Mount Taurus, but the owners demanded a prohibitive price and negotiations were broken off. It was then discovered that the corporation had no underwater grant permitting use of the bottom of the river for docking or dumping. Application has been made for such a permit and a hearing will be held this fall before the State Land Board at Albany. All New Yorkers interested in blocking further disfigurement of the beauty of the Hudson's environs are urged to get in touch with the Hudson River Conservation Society, 542 Fifth Avenue, New York City.

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One of the reasons advanced for restoration of limited shooting of certain species of ducks last year on the protected list is that many of these birds were shot through ignorance and then not collected. One of our members in Portland, Oregon, quotes from local newspaper reports, following the 1937 season, that "hunters have reported seeing scores of illegal ducks lying dead in the brush and tules of the Klamath country, abandoned when it was discovered that they were on the taboo list. Sportsmen stated that only veteran hunters could identify some of the illegal birds on the wing, and that some of these birds fly with legal fowl and are shot accidentally." Our member—Mr. Clarke Van Vleet—arises to make the pertinent suggestion that duck hunters be given some ornithological education. He urges that hunters of migratory waterfowl be supplied, along with their licenses, with folders picturing the different species and instructing them on flight individuality. He also urges a campaign through the press, before each duck season, to provide similar education.

We cannot refrain from stating our conviction that restoring these ducks to the legal list is about the worst method we can think of to educate ignorant hunters who have proved that they do not care what they shoot, not to mention the further risk to these endangered species that is involved in granting this privilege.

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To hold and administer the Hawk Mountain Sanctuary at Drehersville, Pennsylvania, the Hawk Mountain Sanctuary Association has been formed and incorporated in Penn-

sylvania. Mrs. C. N. Edge of the Emergency Conservation Committee has deeded the area to the new organization, and Mrs. Raymond V. Ingersoll has given to the Association the historic Schaumbock House, with three acres and a fine spring, adjoining the sanctuary. Annual memberships of two dollars to make needed improvements are now being sought by the Hawk Mountain Sanctuary Association. Its treasurer is Earl L. Poole, Reading Public Museum, Reading, Pennsylvania.

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However critical we have felt it our responsibility to be with respect to some of the activities of the United States Bureau of Biological Survey, and even of its Chief, Dr. Ira N. Gabrielson, we have never cherished any doubt of his sincerity or personal integrity of mind. His is a difficult position, faced as he is with political pressure and the influence of special interests with selfish purposes. Dr. Gabrielson's soundness of view is well represented in a statement made in a recent radio address. We quote:

> It is an easy thing to wish for the return of the days when millions of buffalo roamed our plains and the sky-darkening flocks of waterfowl dropped into our marshes. It is an easy thing, also, to say, "The evil that men do lives after them," and blame our troubles today on the mistakes of those who have preceded us. The hard thing to do is to act wisely in our own time, correct our own mistakes, and work for a better future—even though this may mean sacrifice on our part. Patrick Henry said: "I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging of the future but by the past". This "lamp of experience" throws light on two great mistakes that between them explain the decrease in our wildlife, and unfortunately, if we are honest, we have to admit that they are not altogether mistakes of the past. One of these is obvious: We have been killing too much wildlife for our own purposes. The other mistake has had an equally serious effect: We have been destroying too many of the areas where the wild creatures can find homes. Our good fortune now is that these mistakes are generally recognized. Restrictions on hunting and trapping are being adopted with the needs of wildlife in mind, and they are being accepted by sportsmen with an increasing willingness to cooperate. Great programs are being carried on to preserve the places where wildlife can live and even to restore some of the areas that have been destroyed. And all this work is being done in the light of new facts that are being learned about wildlife, through research activities that are more numerous today than ever in the past. Best of all, a new generation is being educated in the benefits and needs of wildlife, and this new generation includes wildlife technicians who will certainly bring in a new day in conservation.

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As a refuge for a variety of shore birds, the Tybee Migratory Bird Refuge has been established at the mouth of the Savannah River in Georgia. The refuge comprises about 130 acres and lies about twelve miles south of Savannah.

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Feathered Samaritan

By ELLIS O'BRIEN

LAST summer, a pair of phoebes built a nest in my grape arbor. They were friends of three years' standing, but this was the first time they had built in an accessible place, so I decided to try photographing the young birds when they hatched. I went out one sunny morning, set up my camera, and hid myself behind a tree, about twenty feet away. The phoebes accepted me without comment, and after a few minutes resumed feeding the fledglings. As I watched them, snapping pictures every now and then, I noticed a male house wren hovering around the camera, chattering and scolding in true wren style. He would fly up to the trellis; flit around nervously; edge up to the nest; (alternately singing and scolding) then dash off to a neighboring bush and catch a caterpillar or two; come back, work up a little closer, and dash away again.

Finally, he flew directly to the nest and perched just above it, cocking his head and inspecting the occupants minutely. After a while, he flew away, returning presently with a grub in his mouth. I suspected what was about to happen, but I couldn't believe it possible, for I had never heard of anything like it before. He went to the side of the nest, and when the baby birds, thinking it was one of their parents, opened wide, he poked the grub down the throat of the nearest one! He repeated this several times, and I was able to get a picture of the odd performance. I wondered whether he was really trying to do a good turn, or whether the habit of feeding babies was so strong in him that he couldn't view an open mouth without wanting to find food to put in it!

Mangroves—Makers of Land

By JOHN H. DAVIS, JR.

A RED MANGROVE, TREE OF THE SHORES OF TROPICAL SEAS AND BRACKISH SWAMPS

Interesting cases of adaptation, these trees produce streamer-like drop roots from the limbs, as well as prop roots from their bases

AMONG the most striking of plant "freaks" are the mangroves. They are trees and shrubs belonging to one of the higher orders of plants, yet preferring those salt and brackish water habitats most frequently inhabited by lower forms. Indeed, the oceans along the shores of which they live are the reservoirs of the simpler forms of life. What happened to force these mangroves back into salt water among the primitive algae and animals can only be surmised. If it was ruthless competition, they certainly now grow where no other plants dispute their domain. Having retained their woody complex form and advanced mode of living and reproduction they need not ask for quarter from any competitor that might dispute with them the favorable borders of tropical seas.

Mangroves have developed some remarkable types of adaptations that make them look like "freaks". Leaves, stems, roots and fruits are all adjusted in a singular fashion to water salinity and the rapidly changing conditions of a tidal zone environment. Between the tides is no place for a misfit. Along the tropical marine littoral is a tension zone, often so narrow that all organisms living there constantly feel the impact of the seas from one side and the land from the other side. To survive all daily, seasonal, and catastrophic changes they must successfully live through many adversities.

Living where water levels constantly change and on soils most frequently of plastic muds, their root systems are extensive and unique. The most distinctive form of growth is that adopted by the red mangrove, *Rhizophora,* which grows in the outer, deepest-water part of the swamp. Robust, arching prop roots extend out from their trunks above the mud and water to form successive tiers up the stem. In many cases the bases of some of these roots are five feet above the mean water level. By arching outward they not only extend out from the trunk but often give off arching branch roots of their own. Thus the series forms a succession of branching arches farther and farther away from the central trunk. When these prop roots extend, in this fashion, progressively each year out toward deeper water, the whole root system gives the impression of "walking out into the bay". As the trees in the swamp grow close to each other, a great tangle of

roots is formed so thickly that passage through them is difficult. Most important, this mass of roots slows down water currents and catches debris, bringing about sedimentation and deposition of soil-forming materials. Thus the mangroves, when growing on submerged sections of the shore and on shoals, build up land, extend the coast, and form islands. For this reason they have been called "mothers of islands".

These prop roots supporting the plants against hard wave and wind action are thick and strong. Violent hurricanes, which frequent such coasts, may strip the trunks of their limbs, but they rarely uproot such a firmly-anchored plant. The roots are composed of a hard, vascular core surrounded by thick, spongy, aerating tissue that has access to the air through many lenticels in the epidermis. Thus the roots are able to breathe and transport air from the parts above water to the parts submerged in the stagnant water and mud.

MANGROVES WERE CALLED "OYSTER TREES" BY THE ANCIENTS (BELOW)

Above, the pendant, torpedo-like seeds of the red mangrove, which fall into the water or mud ready to root, but are often carried considerable distances

As though they were taking no chances of being inadequately rooted against wind and wave, red mangroves also send out long, streamer drop roots from their branches even twenty to thirty feet above the water. These extend out and downward to add to the strength of the anchorage system.

In the water both types of roots are the support for many forms of algae and invertebrates that would find difficulty trying to stay put in the shifting muds below. From early times red mangroves have been known as "oyster trees" because of the large clusters of small oysters frequently found attached to their roots. Sponges, other invertebrates, and many beautiful algae grow attached to them, and the debris formed by them adds to the organic accumulations that build up the soils.

Inland from the red mangrove fringe, on elevated or built up parts of the swamp, occur black mangroves, *Avicennia;* and, less frequently, the white mangroves, *Laguncularia.* These trees are without the peculiar prop roots. In the mature swamps they grow in open stands with salt marsh plants between them. This inland part of the swamp is not always flooded, the soils are deeper and firmer, and the outer margin of red mangroves breaks the force of waves and winds. Black mangroves grow to large size, sometimes with old red mangroves among them. Some of both these species are more than seventy feet tall in the great swamps of the southwest Everglades coast.

Black mangrove root systems are also efficiently adapted to submergence. Long, horizontal roots extend out from the trunk through the upper layer of soil. From these arise erect quill-like branches that project upward through the soil and water above the usual high water level. These are pneumatophores or breathing organs. Their tissues are spongy and loose for aeration, and many lenticels pierce their surfaces. In the most elevated parts of the swamps where water seldom covers the soil, the roots bear no pneumatophores. The white mangroves ordinarily do not bear pneumatophores on their roots but, as with the black mangroves, their extensive root systems aid in binding the soil material by a network of numerous rootlets in the upper soil layer. These, with the even more efficient roots of the red mangrove, consolidate the loose materials deposited in these swamps. In some places, organic debris from these extensive root systems and leaf litter accumulate to such an extent that a raw, fibrous peat more than ten feet deep is formed.

The thick, leathery, compact tissue leaves of these plants are not what would be expected of plants growing in water, but seem more characteristic of plants in dry situations. In saline habitats such as this, where the climate is hot, the loss of water from the leaves would be more intense than the rate of absorption from a salt solution

unless the plants protected themselves from excessive water loss by having these leathery leaves. In the case of the black mangrove, salt crystals actually accumulate in abundance on the surface of the leaves under certain conditions.

Most remarkable of all their adaptations to this precarious situation is their method of reproduction and dispersal of seeds and seedlings. The flowers are not particularly different from their land-plant kin, but their seeds take no chances and develop from fertilized flower to growing seedlings without a rest period. In the case of *Rhizophora,* this is accomplished while the seeds are still attached to the parent tree, a process known as vivipary. Growing over ever-changing surfaces of sticky mud and rough waves, and dropping into currents that carry them away, they need to have roots already developed for anchorage when they finally reach a place where they can lodge and continue their growth.

The red mangrove also has provided itself with a type of fruit and seed that strikingly enables it to migrate great distances and become established under very adverse conditions. Without a pause the seeds develop a long, pendant, torpedo-like root that hangs down a foot or more while the fruit is still attached to the parent plant. When fully ripened after about four months, these young plants are shaken loose from their attachment to the fruit and plummet into the mud or water below. Some fall straight enough to insert themselves, root point down, in the mud or peat and take root on the spot. Most of them, however, are shunted off by their oblique penetration of the water, or are washed out by the tides, and float away from the parent plant. Some float farther into the swamp where they meet with furious competition by older plants and few survive. The most interesting ones are those that float away with the currents and bring about the extension of old or the establishment of new mangrove areas.

At first they float horizontally but, by some peculiar provision of their physiology, they gradually become heavier toward their root tip and assume an inclined or vertical position. In this position they have the root tip pointed down so that the prodding action of the waves and tides aids them in planting themselves for future growth firmly and correctly at a new location. Young rootlets may develop while they are floating and thus facilitate anchorage. There is abundant evidence that they have migrated great distances in this manner, for their wide distribution on isolated coasts can not be explained in any other way.

To a less degree *Avicennia* and *Laguncularia* are also adapted to wide and efficient dispersal. These seeds do not seem to stop growth. However, the whole seed falls before roots actually appear. If liberated into water they also are capable of long voyages and their precocious roots may anchor them on foreign shores.

Long is the list of the many peculiar adaptations of these salt-water trees of tropical and sub-tropical shores. The unique vegetational zones formed by them along the low shelving coast of southern Florida may be observed easily, but the swamps are difficult of entry, and few regions in the United States are so little explored. Any one fortunate enough to visit the great Cape Sable and southwest Everglades coast will see a superb mangrove forest, many miles wide, with large, tall trees. Few situations are known where adaptations are so striking as in the tension zone around the tropical seas, and few plants are better equipped to survive than the mangroves.

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Old Man of Katahdin

By ROGER S. BURNELL

ALWAYS on the lookout for interesting rock profiles, I found this one high on Hamlin Ridge, which separates the North and South Basins of Mt. Katahdin in Maine.

My father and I had climbed to Chimney Pond after a long drive from Conway, N. H., to Millinocket. The "Father of Katahdin," LeRoy Dudley, at Chimney Pond told us to watch for a profile on the boulder-strewn Hamlin Ridge as he had seen it there often in his journeys over the mountain. So on our tramp down the ridge, sure enough there it was, "The Old Man of Katahdin" with his mouth wide open laughing at the breezes blowing out of the North Basin. I believe I am the first to photograph this profile, which is approximately seven feet from the chin to the top of his weatherbeaten cap. It is located only a step off the east side of the trail on Hamlin

Ridge, about one and a half miles from Hamlin Peak.

Brighten Up the School Museum

Small habitat groups may be made by simple and inexpensive means

By PAUL GRISWOLD HOWES

WHETHER a school has a real museum, or the simplest sort of a Nature alcove, there is no reason why it may not include small habitat groups that are as beautiful in their smaller way as the large ones in the great museums. The means are simple and inexpensive. School children may take part in providing the ideas and the materials with which to surround specimens, and may learn much in recreating a Nature scene.

Many schools have mounted birds or small mammals. Often these are set on twigs, imitation rocks or sanded boards, looking lonely and very artificial. What they need around them are the leaves, grasses and flowers they knew in Nature. If the school does not happen to have such mounted specimens it is likely that some of the parents of the children have some at home, either gathering dust in the parlor or stowed away in the attic. Many mothers, and even fathers, will be glad to contribute them to serve as a central figure in a school museum habitat group. Or there may be friends who can supply such specimens.

AN OLD BARWAY IN A COUNTRY LANE REPRODUCED WITH VEGETATION MADE BY THE METHODS HERE DESCRIBED. AT THE LEFT IS A SMALL HABITAT GROUP OF BEARS SHOWING THE MOTHER INDULGENTLY WATCHING HER YOUNGSTER. THE FOLIAGE WAS MADE IN THE WAY RECOMMENDED IN THIS ARTICLE

Above all we must discourage, in the present state of our wildlife, the killing of any birds or mammals to provide specimens. Particularly are amateur attempts at taxidermy by school students to be deplored. In fact, a little intensive searching around town, or even a letter from the class to the local newspaper asking contributions of specimens, should be enough. And wildlife will benefit by such an approach.

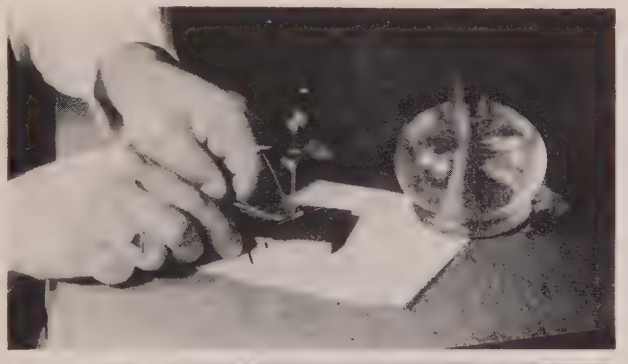
Assuming, then, that a school habitat group is to be made around available specimens, what are the requirements? First a plain wooden base of pine, or other soft lumber, is needed upon which to assemble the exhibit.

If the finished group is to be placed in a case by itself, the base should be made so that it exactly fits into the case bottom, or slides in like a tray. If not, build the base whatever size you wish, but in the form of a tray with a narrow moulding running around its four sides, to give it a neat appearance and to help hold the accessories of the exhibit in place. These bases may be painted black, or they may be varnished or stained, or finished in any manner that may suggest itself. Samples are shown at (a) and (b) in the drawing on page 556.

If your specimens are mounted upon twigs, you may bore small holes in the base and fasten the ends of the twigs in these holes with glue, as shown at (c). If the specimens are mounted upon flat objects such as bark,

SHAPING A COTTON TOADSTOOL STEM WITH THREAD BEFORE COATING WITH PARAFFIN

Note the life-like appearance of the completed specimens. Below, an artificial leaf is being "soldered" to a "waxed" plant stem through the use of a heated needle



CREATING A LOVELY LEAF

Coating a cut-out paper leaf with colored paraffin, after which veins are etched in

they are easily fastened on the base with brads.

If your base fits into a case, you will add greatly to the beauty of the exhibit by painting the interior light blue, and, if you have artistic ability, a simple scene of swamp or meadows or rolling hills may be painted over the blue background. An enlarged tinted photograph, or a colored print, are attractive, but the plain blue background is satisfactory.

When the specimens have been fastened in their places, you are ready for the work that will add realism and beauty to the exhibit. You will need certain simple equipment, such as the following:

An alcohol lamp or other means of heat, perhaps a simple one-burner electric hot-plate. You will require several tin or enamel cups with handles, in which to melt and keep the colored "waxes" for your work, and a flat, soft paintbrush, one inch wide, for each color used. For your "waxwork" you may use common paraffin and artists' oil colors in tubes. You will also need thread, wire of rather fine gauges, glue, scissors, a pair of forceps, and a long needle set in a handle.

To make realistic leaves, take real leaves you wish to copy and trace exact outlines on a sheet of cheap, absorbent pad paper. Cut these out carefully with sharp scissors, including the outlines of the leaf-stems. Glue lengths of fine gauge wire (copper is the best), along what would be the central rib of each leaf, leaving an inch or more projecting beyond each stem as illustrated at (d). These wires will be on the under surfaces of your finished leaves.

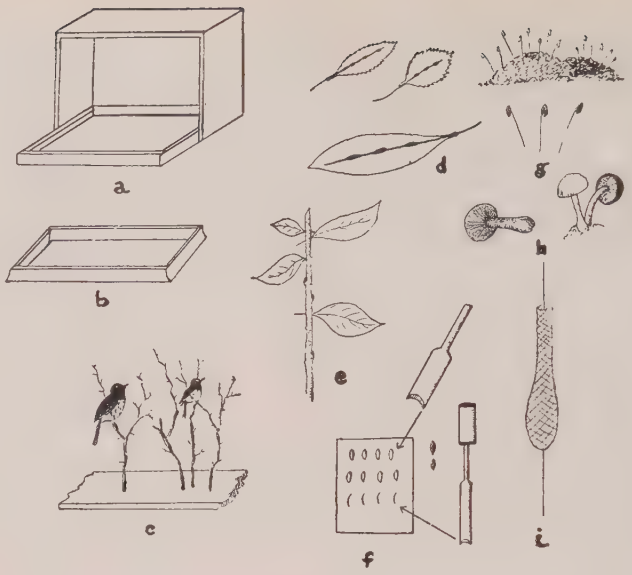
Next melt a small quantity of paraffin in a tin cup and, when it is hot, stir in chrome green oil-color to produce a rich leaf-green solution. Be sure that the paraffin does not get so hot that it fries, and ruins the paint. Oil paint from tubes blends perfectly with hot paraffin. This colored material may be set aside until the leaves are ready; then remelt it and brush a thin layer quickly over each paper form. When you have coated the last leaf, brush additional layers over the leaves until each leaf has a realistic color and finish. A little practice and you will know just how hot to have your material.

On the reverse side of each leaf, you need only one or two coats of paraffin. While the paraffin is still soft on the leaves, tool in the veins with the needle, using the real leaf as your model.

To attach these leaves to twigs and branches, drill small holes, dip the projecting wires in glue, insert them, and cut off the projecting ends (e).

For small, simple leaves, coat a sheet of absorbent paper with colored paraffin, and while it is still warm stamp out leaves by using ordinary gouges. Make one cut, reverse the gouge, make a second cut, and the leaf will lift out (f).

To attach these small leaves, you may use a "soldering" method. Small plant stems may be made of short lengths of copper wire, coated with green or reddish paraffin. Fasten each stem in a cork or anything that will hold them upright, then "solder" on each leaf, holding the leaf in the forceps, and fastening in place by simply touching the stem end, and the upright stem, with a hot needle at the same time, at whatever point you may select. All the foliage shown in the photographs was produced by the two methods described.



SIMPLE METHODS OF GROUP-MAKING
The author describes the processes here pictured

Flowers may be made by the same processes, but each little part must be copied, cut out of paper or wire, coated with the proper colors, and "soldered" in place.

When the principal twigs and branches, their foliage and the mounted specimens have been placed, the ground portion of your mount must be considered. The best grasses to use are natural ones, carefully dried and colored. Fine moss may be dried and then lightly brushed with chrome green paraffin on the higher projecting points, leaving the depressions uncolored. The moss is pressed into place in the group when soft and fresh, and allowed to dry thus before it is brushed with paraffin. Those little fruit-stalks so commonly found growing from moss may be reproduced by cutting short lengths of delicate wire, bending over one end and dipping in colored paraffin that is not very hot. A little ball forms in the bend after two or three dips. These stalks may be inserted in the dried moss as shown at (g).

Brightly-colored mushrooms are also effective for ground work. They are easily made by casting the caps from colored paraffin, the casts being made in any small receptacle that has a rounded bottom. Pour the receptacle about half full of properly-colored paraffin and let it harden thoroughly. To remove the caps, place the mold in hot water just long enough to soften the paraffin. The cast will slide out easily. If the under side of the cap in the natural specimen was colored differently from the upper surface, brush the under side of your model with paraffin of that color. The under side of all mushrooms have either gills or pores. These may be imitated by simply using a cold needle and tooling in the lines or holes just as they are in the real object (h). The stems of toadstools are made by winding absorbent cotton around a wire and binding it into proper shape with fine thread as shown at (i).

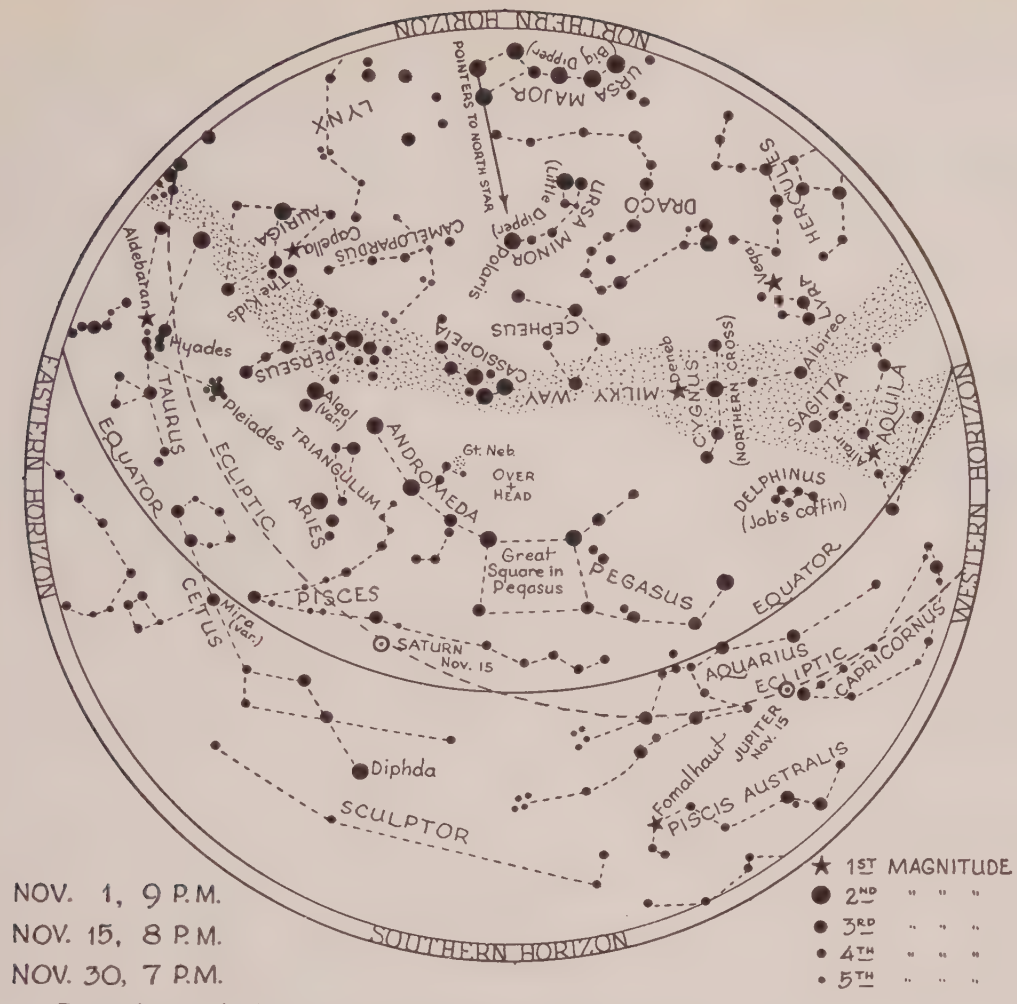
BELOW, A GROUP OF SMALL BIRDS MOUNTED WITH ACCESSORIES DESCRIBED BY MR. HOWES

The stems are coated with the properly-colored paraffin and then "soldered" to the caps. The finished mushroom may be glued in place within the group, or fastened by means of the protruding wires at the ends of the stems, which may be inserted in holes bored in the mounting tray.

Real dead leaves, twigs, small stones and other natural odds and ends should now be glued here and there so that your finished piece of work will appear perfectly natural, and no part of the wooden tray will show between the various objects in the group.

The photographs give a good idea of how natural objects, made by the methods described, really appear. The paraffin blends so perfectly with the artist's oil color that any desired shade may be made. In addition it is so brilliant that the imitation vegetation is extremely attractive and greatly enhances the specimens mounted near it.

Beside adding to the attractiveness of the schoolroom or museum, the preparation of groups of this sort is of marked value in Nature study work. Planning of a group means some background of research to determine just what kinds of things should be included to provide a faithful representation of outdoor Nature indoors. It gives the pupils an interesting creative opportunity.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Sky News for November

By ISABEL M. LEWIS

IN the month of November there will be two eclipses, a total eclipse of the moon and a partial eclipse of the sun. In the eastern states on the seventh of November a strange phenomenon will be observable. The moon will rise almost, or entirely, in total eclipse, with the sun still visible at the western horizon. At Washington, D. C., the total eclipse will begin at 4:55 P.M., Eastern time. The moon will then be below the horizon, but it will rise in the east ten minutes later, entirely immersed in the shadow of the earth shining dimly with a weird coppery glow. Even when the moon is in total eclipse it is illuminated to some extent by the halo of light surrounding the dark side of the earth then turned toward the moon. This thin halo of light is caused by sunlight shining through the earth's atmosphere.

The visibility of the moon during total eclipse varies greatly. Some eclipses are very dark, while at other eclipses the moon appears quite brightly illuminated. It will depend upon how transparent the earth's atmosphere happens to be to the sun's rays in the sunrise and sunset regions. At Washington the sun will disappear below the horizon at 5:02 P. M., Eastern Time, seven minutes after the upper limb of the totally eclipsed moon appears on the eastern horizon. During the seven-minute interval, from the first appearance of the moon to the last appearance of the sun, both bodies will be visible at opposite horizons. At New York the moon will rise at 4:39 P.M. on the evening of the eclipse, six minutes before the total phase begins, and the sun will set at 4:46 P.M. seven minutes after the first appearance of the moon. The same seven-minute interval will elapse at Boston between the rising of the moon and the setting of the sun at 4:31 P.M. There the moon will rise in large partial eclipse twenty-one minutes before the total phase begins at 4:45 P.M. How much of the total phase will be visible in other sections of the country will depend upon the

time of moonrise, or, in general, the time of sunset, which does not differ more than a few minutes from the time of moonrise when the moon is full.

The total eclipse will end at 6:07 P.M., Eastern Time, and the duration of the total eclipse will therefore be one hour and twenty-two minutes. The moon will leave the shadow at 7:12 P.M., Eastern Time, at which time the partial phase of the eclipse will end. The entrance of the moon into the shadow at 3:41 P.M. will not be visible anywhere in the United States, as the moon will be below the horizon, but it will be seen in the Eastern Hemisphere and part of the Atlantic Ocean. In Central Time all the phases of the eclipse will occur an hour earlier and the total eclipse will end at 5:07 C.T., in some localities only a few minutes after moonrise. Throughout most of the central states the moon will rise in total eclipse. Farther west only the later stages of the eclipse will be visible, and on the Pacific coast the eclipse will be over before the moon appears above the horizon. This eclipse will also be visible, wholly or in part, over all of South America, Europe, Asia, Africa and western Australia.

On November 21 there will be a partial eclipse of the sun with 78 hundredths of the sun's diameter covered by the moon at maximum eclipse. This eclipse will be visible only in the North Pacific, the northeastern part of Asia, the Bering Sea, Alaska and the extreme western part of the United States and Canada. In the Pacific states only the first part of the eclipse will be visible; the middle of the eclipse will occur with the sun below the horizon and the sun will set with a small partial phase of the eclipse visible, varying from only 12 per cent in southern California to about 40 per cent in Oregon. The largest eclipse will be observable at Nome, Alaska, 77 per cent of the sun's diameter being covered by the moon at the middle of the eclipse. The eclipse will be visible in that section with the sun above the horizon from beginning to end, and also at Honolulu, although there only 19 per cent of the sun's disk will be covered at greatest eclipse.

November is the month when those who do not mind staying up until after midnight may be rewarded with a display of meteors in the early morning hours. These belong to the annual swarm known as the Leonids. The night of their maximum display is November 15. Members of this swarm are moving rapidly as they are met by the earth "head on", and they are a brilliant greenish-white in color. Between November 17 and 27 one may possibly see some members of the swarm known as the Andromedids, which will appear in the early evening hours. They come from the direction of Andromeda, as their name indicates. They are slow moving and reddish, since they are on the "following side" of the earth.

Orion returns to the evening sky this month, although not rising now until late in the evening. It has often been remarked that the constellations appear much larger when they have just risen above the horizon than when they are high overhead. This is particularly noticeable with such a large and brilliant constellation as Orion. The sun and moon also appear larger to us when rising or setting, and is said to be due to the fact that we unconsciously compare celestial objects, when near the horizon, with nearby objects. As a result they seem larger to us than when they are high overhead and we have nothing with which to compare them. Actual measurement has shown that there is no increase in size of either sun or moon when near the observer's horizon.

One of the largest and finest of the constellations in our autumn skies is the Winged Horse, Pegasus, which covers an enormous area in the sky, its Great Square lying directly on the meridian at nine o'clock on the first of November. Alpha Andromeda is the star in the northeast corner of the Great Square, and so this corner of the configuration does not belong to Pegasus. Andromeda is conspicuously outlined by this star and the three others, two of second magnitude, that lie in a curved line directed toward the northeast from the Great Square. At this time of year, for a short time only, because it lies so far south, we may see the beautiful, first magnitude star, Fomalhaut, in the southern constellation of The Southern Fish, Piscis Australis. Fomalhaut is a white star of the same type as Sirius, and is a near stellar neighbor being only 26 light years distant from the earth. The Big Dipper rests nearly on the northern horizon in the early evening at this time of year, while the big W in Cassiopeia lies high above the pole. These two constellations always swing around the pole diametrically opposite to each other so when one is high overhead the other lies close to the horizon, and when one is east of the pole the other is west of it.

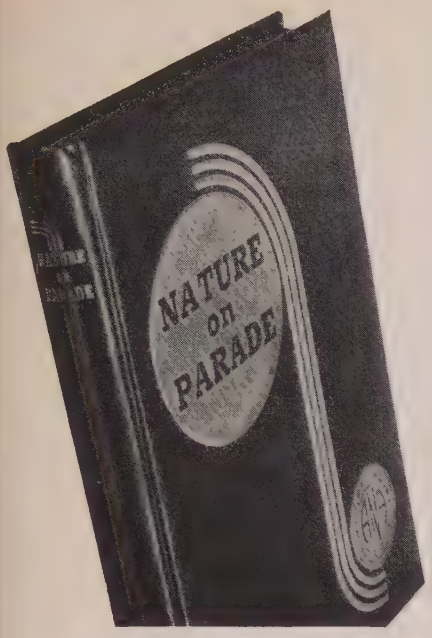
Venus is in inferior conjunction with the sun on November 20, and then passes from the evening to the morning sky. It will be too close to the sun to be seen throughout the month. Mercury is poorly placed for observation this month, although farthest east of the sun on November 25. It will then be only a few degrees above the southwestern horizon and will set an hour after the sun.

Mars is now in the morning sky and rises almost due east in Virgo several hours before the sun. It is reddish in color and now equal only to a star of second magnitude in brightness.

Jupiter will be in quadrature with the sun on November 16 and will be due south at sunset in the constellation of Capricornus. Saturn is now in fine position for observation in Pisces. It is in view nearly all night.

•

"Weeds Above the Snow" is the title of the special insert in the December issue of Nature Magazine. Following the style of the October insert, this feature suggests a field of Nature interest and activity generally overlooked in the winter. The editors will appreciate any comments or suggestions from readers on these inserts to the end that this program may be made to serve every possible practical use.



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INDOORS AND OUT

(Continued from page 519)

man", is a quotation from Flagg that might very credibly be attributed to one of our own day. One reads that the clearing of the forest is equally the cause of both drought and inundations, and that "he who believes that every acre of waste land is so much drawback upon national wealth must have very imperfect views of Nature's economy." In another chapter of the same work Flagg points out that "if we would preserve our forests, we must also, in about the same ratio, preserve the wild birds and animals that inhabit them." Certainly there can be no harm in calling this man's writings anew to the attention of American readers.

A Year with the Trees—or *Woods and By-ways,* from which it was taken—is also of interest because of its "dedicatory epistle", which is of unique autobiographical value. "I am not a member," Flagg said, "of any society or club, or any church or institution, trade, profession, or organization. I have lived entirely without honors, and have never rejected any. My wife and children have been the only companions of my studies and recreations. But, perhaps from this cause alone, I have been very happy." He wrote further that he had studied Nature more than the library and that it had been his principal aim to express his thoughts "with clearness and simplicity."

Flagg's style makes for pleasant and ready reading. Thoreau in a letter once criticized it as "singularly vague" and made the generally excellent comment that "if you indulge in long periods, you must be sure to have a snapper at the end." Thoreau, however, could have read only the early book and magazine articles (which I have not seen), and apparently the faults, if real, were remedied by Flagg. For his later books are written with great clarity, exactness, and directness. They are straightforward. "I have not studied to express my thoughts by any peculiarity of language," Flagg wrote, "but by the use of simple and common terms to render them lucid and interesting." And there seems to be no fear that Flagg's style will hinder any reader from enjoying his contributions to American literature on Nature. They need only to be examined to be appreciated.

Cornell Leaflet

The September, 1938, issue of the *Cornell Rural School Leaflet,* being Volume 32, Number 1, is devoted to the elementary science library. Prepared by Eva Gordon, who for ten years has been working on the problem of making the elementary school library serve better the field of Nature study, or elementary science, this issue contains an immensely valuable bibliography of suggested texts, all of which are carefully described.

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER
Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Elementary School Programs

Inquiries are frequently received by the American Nature Association regarding the nature of different elementary school science programs and the techniques by which these programs are prepared. It is appropriate, then, that a summary of these programs and practices be given.

Offhand, one might think that all programs in Nature Study for the elementary schools of a state area would be prepared in the same way. This is not so, nor are the programs for smaller areas all prepared in the same way. Perhaps this is fortunate because it gives one an opportunity to analyze the strengths and the weaknesses of the different procedures and move closer to the ideal.

Briefly, the procedures followed in the preparation of various state outlines fall into the following categories:

1. Outlines prepared by classroom teachers under guidance of supervisors, such as college professors.

2. Outlines prepared by representatives of various interested state agencies; these are submitted to classroom teachers for criticisms and suggestions.

3. Outlines prepared by experienced faculty members of the teacher-training institutions of the state, with or without the cooperation of active classroom teachers.

4. Outlines prepared largely through the activities of experienced teachers in college classes in education under the supervision of a college professor.

5. Outlines prepared by a committee of state education officers and college professors; these are reviewed by members of the faculties of teacher-training institutions and classroom teachers, and revised, supposedly on the basis of the suggestions received.

Almost every imaginable combination of these methods may be found to have been followed in producing the various outlines now in existence.

A fair example of the outline prepared by classroom teachers under guidance of supervisors is to be found in one of the Baltimore, Maryland, outlines. It illustrates both the strength and the weakness of the technique.

In the first place, an outline prepared by classroom teachers is likely to be circumscribed by the limited technical academic experience of the teachers themselves. They may be, and generally are, sincerely interested in making a worth-while contribution, but their knowledge of science is often too limited for them to make the most of the opportunities presented. They almost invariably make suggestions of an academic nature, overlooking local applications that they have not been accustomed to recognize. They may make, unintentionally, many errors of fact, relying on the supervisor to correct these as a part of his duty. Unfortunately, the supervisor frequently does not take his responsibility seriously, and may assume that his own popularity is best maintained by letting well enough alone. He is inclined blindly to praise what he should know is not praiseworthy.

Outlines prepared by this technique are common and frequently fail when they rely more for critical judgment on professors of education than on professors of academic science. In one such outline we find, in a test section highly praised by the supervisor, the statements that the earth is the center of the solar system, that garbage cans are made of tin, and that woodchucks protect themselves by "freezing" rather than by escaping or fighting.

It would seem that the weakness of this first technique lies essentially in the lack of technical training of the classroom teacher and in the laziness or laxness of the supervisor. Theoretically the system should work. Practically it has rarely done so.

The program prepared by representatives of various state agencies may be illustrated by the Pennsylvania outline. In the preparation of the original draft of this outline such state agencies as the highway commission, the conservation department, and others, drew up a mass of material for inclusion in the outline by the State Education Department. This was then printed in a tentative form and submitted to the teachers for recommendation. The revision was then published as the finished product. It is rather doubtful if any state outline now in existence is superior to this outline for use in graded city schools. It is, however, obvious that among the individuals who prepared and advised on this outline, representatives of the rural schools, where state outlines are usually mandatory, were not given the recognition to which they were entitled. As a result the organization of the Pennsylvania outline is such that it cannot be easily adapted to the rural school situation. The weakness of a technique such as was followed here possibly lies in the faulty evaluation of the various contributions by the final authority. It is easier to accept such offerings from one group than to get more appropriate offerings from a less aggressive group. Rural teachers are too frequently overruled by city groups for their own good, and as a result their interests are often not adequately represented.

The technique of preparation by faculty members of teacher-training institutions is possibly best represented by the New Jersey outline. Theoretically it would seem that these people, presumably adequately trained in academic science and interested in the problems of the classroom teacher, would be the best qualified of all groups to prepare a satisfactory program.

In New Jersey there was the necessity of getting the outline rapidly into its final form to assure its publication. This both prevented submission to enough classroom teachers and even limited the opportunity of members of the committee to understand what their associates were doing. Different committee members were given responsibility for the work at different grade levels. It is obvious from the results that there was little evidence of a well-planned cumulative program. There was undesirable duplication, and certainly some of the work suggested for some of the lower grades was more difficult than that suggested for the upper grades. Some of the more difficult work suggested for the upper grades lacked preliminary training in the lower grades. These mistakes could have been avoided had there been more time allowed for the preparation of the outline. There are a few places in this outline where academic science specialists could have contributed worthwhile enrichment. Here, also, there is little evidence that the problems of the rural school are given just consideration.

Presumably outlines prepared for governmental units smaller than a state by supervisors of those communities might be grouped with this New Jersey example. A supervisor presumably has more technical training than the classroom teacher. Presumably, also, the supervisor has a better understanding of real classroom problems than a teacher-trainer, or a college professor, who may not have kept in touch with them. It is, however, dangerous to assume much of anything in these matters, and often the supervisor has few of the supervisor qualities that may have appeared in his letters of recommendation. Frequently they are so satisfied with the importance of their position that they see no sense in looking to any authority beyond their own experience. Such an attitude, of course, is always dangerous.

One outline prepared by supervisors begins bird study with the drawing of a picture of *Archaeopteryx,* and states that the cougar, mountain lion and panther have all disappeared from the hills nearby. The supervisor who begins bird study with *Archaeopteryx* because it was the first bird-like creature may be using logic but not psychology, and the supervisor who does not know that the cougar, mountain lion and panther are the same animal has no business supervising the study of natural history, no matter how splendid the recommendations he may hold, or how many important positions he may have held.

The fourth type of procedure, where experienced teachers work together in college classes in education to produce a program, was followed in part in the production of one of the Missouri outlines. Like the other techniques it has its weaknesses and its strength. Like the others it may fail to enlist the cooperation of specialists in the academic field, and may fail to recognize the problems of the poorer teachers who do not have, or have not had, the opportunity for carrying on graduate work. Such programs are often written on the assumption that an abundance of suitable reference material is available to all teachers. This is too often not the case. Such programs are almost invariably prepared by groups with little rural school experience, and, possibly, with less interest in rural school problems. Instead of focussing the efforts on helping the weaker links in the educational system, those who prepare these outlines are inclined to improve the offerings of those groups already best qualified to help themselves.

The fifth and last technique, where a program is prepared in part by college professors and state supervisors, submitted presumably to teacher-trainers and classroom teachers and revised over a period of years, might be illustrated, in theory at least, by the new outline for New York State.

This outline was begun more than a decade ago, and began with a large representative committee. For a number of years this committee worked on a program, and rather satisfactorily reconciled their differences and

made compromises. The program developed by the committee appeared tentatively at least three times, but was finally prepared almost entirely by individuals who were not members of the original committee. Theoretically such a program should be truly representative of the best judgment of a community. The writer, who was a member of the original committee, has not seen the finished outline and cannot, therefore, pass judgment on it. If the outline is not successful, however, it cannot be due to lack of cooperation of all interested groups in the state. Those who had final responsibility in the matter had the opportunity of accepting or rejecting the offerings of all interested parties. The success or failure of the outline depends on the value of their judgment in this matter.

October at Waterville, N. H.

by Dorothy W. S. Coffin

It was in late October and the loveliest of the reds had vanished already from the mountain trees—but we found walking in the golden paths much to our liking.

We had climbed for about half an hour up the slopes back of the hotel, missing the sunlight we had hoped for, but enjoying the rich nutty odors from the fallen leaves as we kicked them from their moist holes, and looking onward and upward at the architectural beauty of the branches against the sky. The light was soft and subdued in the dull yellow of the beech trees. Then, with theatrical suddenness, out came the sun, and to our astonished eyes, every trunk, every branch, every ledge and rock became an intense incandescent blue. Above, beneath, and around us shone the leaves of the beech trees, a shining, dazzling gold that escaped now and then to the floor of the forest, like a bolt of sunshine.

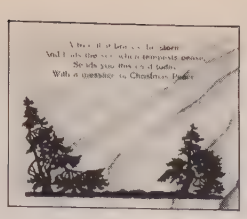
We stood as if in a trance and moved softly upward, fearing to break the spell. For almost a quarter of an hour we moved in that enchanted forest, until, just as suddenly as it had come, it vanished. Gone was the sun and its stroke of magic. Back again was the brooding, gentle mood of October.

Finny Oddities

The prolific writer, A. Hyatt Verrill, has added another volume to his lengthening list of Nature books, and another to his series of books on the strange in Nature. This latest is entitled *Strange Fish and Their Stories*. Among the inhabitants of the waters—salt and fresh, tropical and arctic—there are many fish of interesting habit, formation and life history. Mr. Verrill covers this type of fish life with commendable thoroughness. The book is published by L. C. Page and Company and sells for $2.50.

Grass of Many Waters

Lewis Hanford Tiffany is chairman of the department of botany at Northwestern University and has, for twenty-five years, been interested in the study of algae. From this interest and study comes a book, *Algae, The Grass of Many Waters*, through which the author seeks to answer many questions asked him by students and laymen, and to present, in fairly popular form, the story of algae, past and present. Published by Charles C. Thomas, this fine book sells for $3.50.



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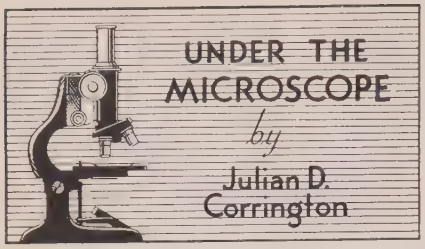


Insect Whole Mounts

Since the September, 1937, issue wherein appeared some elementary instruction on making slides of insects and their parts, a number of requests have come in from readers to carry the story a bit farther.

By whole mount or toto mount in microscopy is meant the preparation and mounting of an entire object, without sectioning, and may take the form of a complete organism, as a Daphnia, or a part, such as the stomach of a mosquito, a moss leaf, a seed, a hair or an embryo. With insects whole mounts are usually confined to the smaller species, not readily studied without magnification; fish moths, spring tails, aphids, scales, fleas, lice and such insect allies as ticks and mites. Whole mounts of larger examples can be made, if desired, limited only by the size and bulk of the subject and the requirement that, if the slide is to be observed by transmitted light, the finished animal must be translucent. Otherwise reflected light would have to be used and nothing much would be gained over ordinary study of a pinned or preserved specimen with a hand lens or binocular microscope.

Very small insects can be and frequently are mounted without much processing, as previously explained. A flea—classic subject of interest to explorers in the realm of the microscopic—may be dehydrated in the regulation alcohol series, cleared in xylol and mounted in balsam, with cover glass props When so prepared, however, the thicker portions will be opaque to light and present a dense black appearance. A much better and more professional job involves merely a few extra steps, notably one termed *potashing*.

For this purpose make up a ten percent solution of potassium hydroxide (caustic potash) in tap water, remembering that this highly caustic material must be handled cautiously. Kill several cat or dog fleas in a cyanide bottle or hot water and place them in a small, worthless metal container with the potash solution; the top of a tin can of baking powder is a perfect vessel for this work. Heat over a small and low flame, as that from an alcohol lamp, for fifteen minutes, but do not allow to boil. Transfer the fleas to a container of tap water for an hour or two, whereupon the swelling attendant to the taking up of water will cause the expulsion of some of the body contents in each specimen. Now repeat the potash treatment and the water soaking for a second time, but carry the washing in water on for several changes over a period of three or four hours, to get rid of all traces of the potash. The fleas are now ready for the usual dehydrating in alcohols, clearing in xylol and mounting in balsam.

Other insects are processed in similar fashion, varying the duration and severity of the heating in potash according to the size and toughness of the species. Larger and heavier insects may be boiled for a short time—usually not over five minutes—in the potash solution, but care must be exercised or the specimen will go to pieces. Trial is the best teacher here, and if one has the time and patience a prolonged soaking in hot potash, even for two or three days, is better and safer than boiling.

WHAT IT TAKES TO MAKE A DOG'S LIFE A DOG'S LIFE—TO WIT, A FLEA

The purpose of potashing is to remove the interior contents of the body in order to render the specimen translucent and lighter in color. All that one studies in insect whole mounts anyway is the exterior, technically the exoskeleton of the animal and this, being composed of a very tough substance known as chitin, is not harmed in the process. Chitin (pronounced kí-tin) is allied chemically to silk, hair and horn, and is an organic product widely used as a supporting tissue by various animal groups. Insects have their skeletons on the outsides of their bodies instead of on the inside as with ourselves and our vertebrate associates.

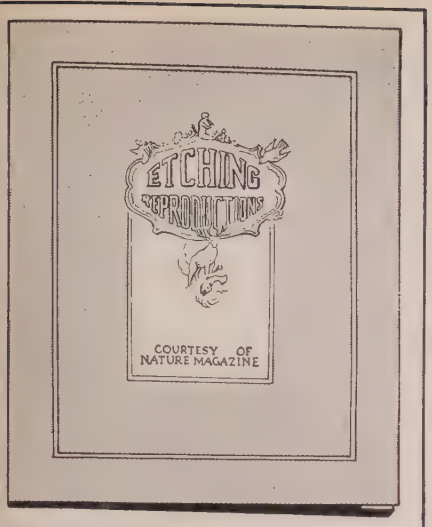
Potashing, by removal of inner tissues that cannot be seen through the exoskeleton, also allows flatter mounts. At the same time, the remaining integument lacks its customary supports and is more fragile and must be handled delicately. Dehydration immediately begins to harden all the joints so that thereafter they are inflexible, hence *positioning*, if necessary, must be done in the first alcohol. Note picture of a mosquito (P. 564) whole mount and observe that the two wings are spread without overlapping, the six legs and two antennae all show separately and no one part is doubled up or conceals any other part. The proboscis is also pulled out and revealed, though it cannot be seen at this magnification. Incidentally, observe the cover glass props, cut with scissors from a sheet of cellulose acetate, a material obtainable in many thicknesses and very easy to cut or shape. This slide shows excellent positioning and such results do not come about without a certain amount of fussy work.

After completion of washing, insects are transferred to a Syracuse watch glass containing fifty percent alcohol and the glass mounted on the microscope stage for work under the lowest magnification available. Using dissecting needles—small needles mounted on match sticks are excellent—the legs, wings, mouthparts and antennae are severally pushed or pulled in one direction or another so that all parts are fully visible, without overlapping. The joints of legs should be somewhat flexed, since straight legs are unnatural and folded up appendages conceal some of the structure. Sometimes these parts will stay in the new position, sometimes not, and in such cases they must be variously propped and weighted to keep them as desired until the hardening action of the stronger alcohols sets them permanently.

Bits of broken glass and small strips of glass cut from a slide or of glass tubing drawn out over a flame to a fine diameter are all useful in this work. Wedge pieces between legs and body or between different joints of the same leg, or weight down leg joints with glass strips; a little practice will develop sufficient resourcefulness to suggest still other materials and methods.

Once positioned, care must be used in changing alcohols. Draw off the old fluid cautiously with a pipette and add the new in the same manner, avoiding any disturbance of the positioned insect. Transference of the cleared specimen to the final slide must also be done with care to prevent breakage of fragile parts. Use a section lifter or a thin strip of stiff cardboard with the terminal half-inch bent at an angle and bring this up under the insect as it floats in xylol. Lift up and carry across to the slide, depositing in a considerable quantity of xylol to float the animal off onto the slide. Or, better, work a slide beneath the specimen as it lies in its dish of xylol and "swim" the insect onto the slide by gently squirting with a pipette or poking with a camel's-hair brush or toothpick, or blowing with the breath. When final arrangements on the slide have been completed, drain off excess xylol and mount in balsam, with props.

Another stunt worth knowing concerns the weighting down of the cover glass on thick balsam mounts while they are harden-



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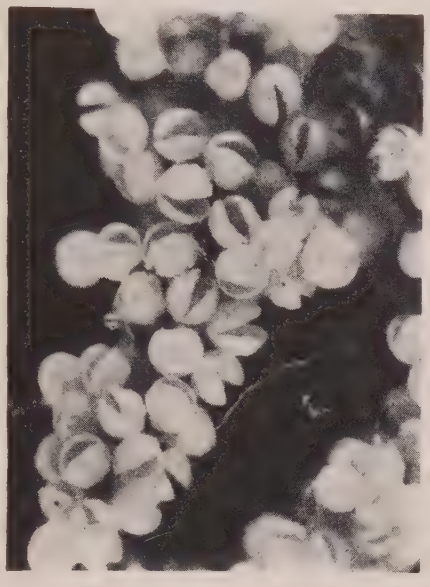
ing. Sometimes the object tends to curl up and raise the cover, admitting air bubbles to the balsam. Some technicians prefer a simple form of spring clip; others place bullets, pennies or any similar metal objects directly on the cover glass—anything that combines relatively heavy weight with a size small enough for this purpose.



SPORE CASES OF CINNAMON FERN WINS PRIZE AWARD

Photomike Contest

The prize award this month was captured by Frederick G. Finger, 1778 Fay St., East Cleveland, Ohio, with a splendid picture of an unusual subject, reproduced herewith. Microscope, Zeiss ESA-105; 36 mm. objective, 7X Huygens eyepiece, no condenser, magnification 30X. Camera, Brownie 2C folding, 10″ extension; panchromatic cut film, 3¼ x 4¼. Illumination, two 50 cp, 6-8 v. auto headlight bulbs in handmade stage lamp, object resting on a blue background, reflected light; exposure 10 seconds.

Second place was awarded Robert Alberty, Lincoln, Neb., for a very fine shot of cricket antenna, and third place was taken by the winner, Mr. Finger, for an interesting view of the tail filaments of the May-fly nymph.

Send in your entries early, folks, for the January contest. You can use that $5.00 for Christmas! See the May, 1938, number for full particulars.

Historical Outline

According to Professor Ford, the term *microscope* was introduced by Giovanni Faber in 1625, in a letter to the *Academia dei Lincei* (Academy of the Lynx-eyed Associates), one of the earliest of scientific societies. It was applied to an instrument of Galileo's, designed to look at small objects. Galileo, himself a member of the Academy, used the term *occhiale* (fly-glass), a word later changed to *occhialino,* and stated that one could "see a fly as large as a hen."

Sometime before 1618, this same Academy gave the name *telescope* to another of Galileo's instruments, for looking at objects at a distance. Inasmuch as with the Galilean

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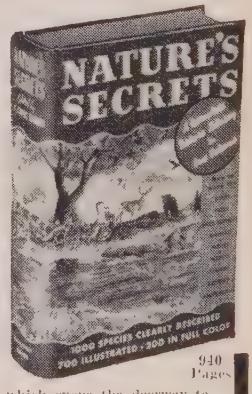

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NATURE'S SECRETS

Edited by G. CLYDE FISHER

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type of optics, with a plano-convex objective and a plano-concave eyepiece, the same setup could be used either as a microscope or a telescope by varying the distance between the two lenses, these glasses soon came to be called a *microscope-telescope* by some and a *telescope-microscope* by others.

As is the case in our own day so in seventeenth century Europe—the scientific invention of one year or decade became the popular toy of the next, and not long after the era of Galileo we find that flea-glasses, *vitrea pulicaria,* and fly-glasses, *vitrea muscaria,* were cheaply manufactured in quantity for public amusement. The usual form of these, which were simple microscopes, was a tube about the length and diameter of the thumb, with a single lens at the viewing end and a piece of plane glass at the other, onto which the flea or other object was fastened. Held against a source of light, these magnifiers gave a satisfactory image of considerable enlargement.

Soon these fly-glasses were elaborated by means of ornamentation and carving on the tube, and there came to be various grades from plain and inexpensive models for the ordinary person to costly and decorated types for the wealthy aristocrat. The lens employed was changed to a spherical form "not larger than the smallest pearl" and Locy states that by 1679 such *microscopia globularia* were on sale in the shops of Paris.

From this point on it is necessary to follow the development of simple and compound microscopes separately. And there is another side to the picture, too—the use to which these early instruments were put. The persons we have been describing thus far were makers and designers of microscopes but not—incredible as that may seem—the ones who employed these marvelous new inventions in advancing biological science! Jansen was professionally a lens-grinder; Galileo and Kepler were primarily astronomers and concerned themselves chiefly with the telescope. There has yet to come upon our stage a man who took that new scientific toy, the microscope, and did anything more with it than to gaze speculatively at small insects and write about "that wonderful microscope by which a fly was made as large as an elephant and a flea the size of a camel."

National Society

This issue went to press too early for any report on the proposal of last month—*Shall We Have A National Organization?* By the December number we should be able to give a rather complete statement. Meanwhile, those who favored our suggestions and who presumably sent in their questionnaires will no doubt find the following figures interesting:

Five hundred questionnaires were sent out, that being the number of names on hand September first of those who had written in to make general inquiries or to request one or more of the pamphlets on microscopy advertised for free distribution. Of these, 374 or 75% were men and 124 or 25% women, 23 being married women. The remaining 2 letters came from firms. There were 12 doctors and at least 66 teachers, though probably the latter figure is much too small since many teachers doubtless used their home address and the profession did not appear on our card records. Ages ranged from 14 to over 70.

POSITIONING IS WELL SHOWN IN THIS FINE MOUNT OF A MOSQUITO

Every state in the Union was represented except Georgia and Nevada, New York leading with 58, then Pennsylvania (45), Illinois (39), California (36), Ohio (30), New Jersey (27) and Minnesota (23) making up all those with more than twenty persons each. Five Provinces of Canada contributed 16 readers and there was one each from the Canal Zone, Hawaii, Mexico and Colombia. In addition, all of the major cities of North America were included except Cincinnati, the leaders being New York (20), Chicago (11), Philadelphia (9) and Baltimore and Minneapolis (7 each).

Trade Notes

Like a condensed textbook on microscopy is the Leitz booklet, *The Microscope and Its Application,* which you may obtain by sending a request and a three-cent stamp to this Department. Some of the material is elementary, some technical, with a great deal of meat for readers of all stages of advancement. There are 36 pages and the many illustrations are splendid and very helpful.

* * *

How would you like to go on a scientific expedition aboard a two-masted Diesel schooner into that seldom visited arm of the sea, the Gulf of California? Next best to going in person is without doubt a literary trip with William Beebe, who needs no introduction to those whose reading program includes natural history. *Zaca Venture,* just published, is a thrilling account of studies and collecting among birds, fish, crabs and countless other denizens of tropical waters, the region proving to be a paradise for the devotee of sailing, the fisherman, or the scientist. Twenty-three halftone illustrations go far in assisting vivid word pictures in making the reader feel himself one of the party. Harcourt, Brace & Co., 383 Madison Ave., New York City. $3.00.

* * *

The Book of the Microscope, by A. Frederick Collins, is a distinct addition to the library of any amateur microscopist. The author is well known for many books on elementary science and has a pleasing style, while the volume is extensively illustrated with many helpful drawings. There are chapters on lenses and microscopes—what they do and how to use them; on illumination; on collecting, preparing and studying a host of materials; plant, animal, mineral and household. Readers are certain to gain many worthwhile hints and methods, no matter how many other similar works they may have read. D. Appleton-Century Co., 35 W. 32nd St., New York City. $1.50.

* * *

How do you clean the lenses of your instrument? Care must be exercised to use only materials that will not scratch the soft optical glass, and professionals generally employ an especially fine grade of Japanese tissue prepared expressly for this purpose and termed lens paper. Two forms are provided, loose sheets or bound books. We greatly prefer the convenience of the latter and the protection from dust afforded by the stiff book covers. The Will Corporation, Rochester, N. Y., catalog number 11717, each 15c; dozen books, $1.50.

* * *

If you admire or enjoy the photomicrographs that each month accompany our feature articles, give a thought to what lies back of the photography itself, no matter how excellent that may be. Someone had first to make the slide, and a good photograph of a poor slide would not serve our purposes. Unless otherwise noted in the caption, slides for photomicrographs are loaned us through the courtesy of Ward's Natural Science Establishment, Inc., P. O. Box 24, Beechwood Station, Rochester, N. Y., one of the largest and best of the institutions dealing in natural science materials for schools, colleges, collectors and hobbyists. If you collect minerals, insects, slides or other natural objects you should write to this firm and receive their literature.

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Diana Thorne's

DOG COLUMN

THE NEW ARRIVAL

WHEN you acquire a puppy, be he pedigreed or mongrel, give him a name and teach him to respond to it. Teaching him to associate himself with the sound of the name you have given him will, like every other stage of his education, take a little time and more patience. With the puppy you have also received the responsibility of exerting time and patience, good temper and endurance, understanding and sympathy to the nth degree as long as you have your dog.

Your puppy must have the utmost attention you can spare for him. If you are a very busy person socially or otherwise *don't* have a dog, or, at least, a puppy. If you live in a city apartment, and the bellboys, doormen, a chauffeur or a maid have the care, the feeding and the exercising of your dog, it will be unreasonable and optimistic to expect your dog to be a companion, or to regard you with respect or as the one possessing authority. Nor is it likely that his nature will be improved by absent treatment.

A puppy's diet is of great importance. After he is full-grown, his habits are formed and his diet takes care of itself, more or less. But the dog can be ruined as a puppy if the proper food in the proper quantities is not given him at the proper and regular time. It is obvious, also, that the St. Bernard's diet must differ considerably from that of the Pekinese! It is a simple matter to be right in dietary care if you take sufficient trouble and attend personally to your puppy's needs. There are, in fact, little pamphlets given away free by the makers of dog-foods and dog-medicines. These are guides for your own understanding of the subject.

Be sure that your puppy, while he looks "cute" and *is* amusing in his babyhood, will do a great deal to strain your temper and patience. Be prepared for it. He will chew your slippers, and chew and worry your rugs. He will eat, or attempt to eat, this, that and the other, such as telephone and light wires, nails, leather and rubber objects, even books. All these may appear as quaint desires in diet if you do not understand that he is teething.

If you cannot keep him away from rugs and slippers and other objects, try to keep them away from his teeth and sight. Supply him with rubber bones or other toys, and balls to play with and to chew. Teach him that certain places in your house are his very own. Let him have a basket or large box, straw-bedded or rag-lined according to his size, out of draughts and comfortably situated. Teach him to sleep there and not on your couches and chairs and beds.

Except at night, don't leave him too long alone. Don't let him mope, weep, or fret. Keep him interested and happy. Doing so will be a strain upon you but later you will be repaid. Discourage him from jumping up on you in exuberance. Do this at first and your guests, friends, visitors and tradesmen will not have

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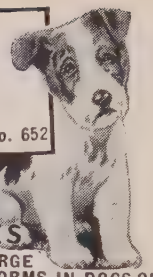

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THE NEW ARRIVAL

(Continued from page 565)

cause to complain of ruined clothes. A dog has a tail. Let him use it for greetings and welcomings.

In housebreaking the puppy (and that's the *first* lesson) the task will be easier, of course, if you live in the country than if you live in the city. It is easier to open the door to the yard than it is for you to get dressed hurriedly on his urgent summons, wait for the elevator, and parade along crowded pavements while he inspects a score of lamp-posts and hydrants and shop-fronts.

The training of the puppy to the use of the street at the curb rather than indiscriminately on the pavement is of prime importance in the city. There is, in fact, an increasingly large body of opinion growing in disfavor of the dog as much as for the horse in modern cities, and for obvious reasons. To be careless with your puppy's manners is to encourage this antagonism, which, in its fullness, might banish the dog altogether from the city. In fact, I believe, this is likely to come in time.

Science Everywhere

A series of broadcasts on Nature and science is to be presented by the American Association for the Advancement of Science, in cooperation with the National Broadcasting Company, Blue Network, 2-2:30 P. M. Eastern Standard Time, each Tuesday beginning October 18.

Broadcasts will be written and delivered by Dr. Carroll Lane Fenton, of the A. A. A. S., an author of children's science books and a radio speaker on science. He has been heard most recently in *Science on the March,* the Association's weekly program for high school students and adults.

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About Our Forests

The Nation's Forests is the title that William Atherton DuPuy has given to his book on forests, forestry and lumbering in the United States. In it he pictures the past and present forest resources of the country; describes their importance in our national economy and prosperity; discusses the growth of the National Forest system. In fact, Mr. DuPuy, who knows well how to write meaty fact for popular consumption, has done a fine job in this, his latest book. His publishers, the Macmillan Company, have collaborated splendidly in permitting liberal and excellent illustration and by providing fine paper for a book that is as attractive as it is useful. The price is three dollars.

Snakes and Turtles

Two related leaflets of interest to reptile students came to hand in the same mail. These are *Turtles of the Chicago Area* by Karl P. Schmidt and *The Snakes of San Diego County* by C. B. Perkins. The former is curator of amphibians and reptiles of the Field Museum of Natural History, Chicago, and the leaflet is one of the museum's zoological series and is available at twenty-five cents. Popularly presented, it includes two excellent color plates. Mr. Perkins is the herpetologist of the Zoological Society of San Diego, and his 66-page bulletin is one of the series being brought out by that active and excellent society. With pictures, descriptions and key, it is a valuable contribution. The price is fifty cents.

On the heels of these two, a third related leaflet arrived, this one being *Amphibians and Reptiles of Grand Canyon National Park.* Its title is descriptive of its contents and it is another bulletin of the Grand Canyon Natural History Association. Its author is Natt N. Dodge, who seeks to make friends among visitors to the Canyon for the resident amphibians and reptiles. He does a splendid job. Copies are available at twenty-five cents each from the Association, Grand Canyon National Park, Arizona.

More about Vines

Editor Nature Magazine:—

In the interesting article you had on *Plant Acrobats,* the terms "dextrorse" and "sinistrorse" are used in the same sense that they were by Linnaeus and his contemporaries, but 19th century botanists interchanged them, as one can learn by consulting a dictionary. Whatever the merits of the case, modern usage is easiest to remember, for a dextrorse vine, as now defined, twists like a right-handed screw, and vice versa.

The idea was once current that vines in the northern hemisphere twine to the right (dextrorse), while those in the southern hemisphere grow in the reverse direction; which is obviously untrue, for we have both dextrorse and sinistrorse climbers in this country, as Mr. Hodge has indicated. But the former seem to be decidedly in the majority here, and the proportion may possibly be reversed in the southern hemisphere, though I lack information on that point at present. (Perhaps some reader in the antipodes can enlighten us.)

Besides the three methods of climbing that account for the majority of vines, namely: twining, rootlets and tendrils, mentioned by Mr. Hodge, there is another which as far as I know is unique. *Pieris phillyreifolia,* which is too little known to have a common name, but belongs to the heath family, grows in cypress ponds in southern Georgia and Alabama and northern Florida. It has lately been put in a genus by itself, *Ampelothamnus,* by Small. It is sometimes a small erect shrub, but usually climbs cypress trees, often to a height of twenty feet or more, by pushing its flattened stem upward under the outer bark, and sending out shoots with leaves and flowers every few feet. At first glance one might take it for a parasite; but its stems can be traced down to the ground, and they have no organic connection with the supporting tree. I discussed this species in *Torreya* (New York) for February, 1903, and in my bulletin on the trees, shrubs and vines of Alabama about 25 years later.

Mr. Hodge mentioned incidentally that some twining vines are assisted in holding on to their supports by hooks or bristles. I am not personally familiar with any such case, but there are many vines that depend wholly or mainly on hooks for support. The most familiar examples are our various climbing roses. Another is *Elaeagnus pungens,* an evergreen from eastern Asia with fragrant flowers in late fall and edible fruits in spring, now commonly cultivated in the South. It is usually kept trimmed to shrub form, but if permitted will send out numerous ascending whip-like shoots with short stiff deflexed spurs (rudimentary branches) every few inches, and those enable it to climb a tree or anything else that may be handy.

I believe there are many hook-climbers in the tropics, some woody, such as the rattan palm, and some herbaceous, such as several species of *Scleria,* of the sedge family. (One of these with stems several yards long, that grows in tropical South America, was given the expressive specific name of *flagellum-nigrorum* by the 18th century botanist who first described it.) There are also a few herbaceous hook-climbers as far north as Canada, familiar examples being in the genera *Tracaulon* (tear-thumb) and *Galium* (bedstraw).

Still other vines, mostly herbaceous, but some woody, like the dewberry (*Rubus* sp.) run along the ground without attaching themselves to anything, while others send down roots every few inches.

There are some other interesting features about vines besides their methods of climbing. For example, most of the woody ones that I am acquainted with have light porous wood. The advantage of that is obvious, for if vine stems were as heavy as others of the same size they might bend down or break shrubs and small trees that they climb on, and thus defeat their own ends, so to speak.

A fairly common sight in a forest is a tendril climber, such as a grape vine, going straight from the ground to a limb of a tree perhaps 25 feet up, with no intermediate support. I have never discovered exactly how that happens, but would guess that the vine got its start on lower limbs that have since died and disappeared, or perhaps on a smaller tree that has met the same fate. This is a problem that deserves investigation; and all intermediate stages should be discoverable by a patient observer.

Tecoma radicans, the trumpet-creeper of the southeastern states, which attaches itself to trees, stumps, buildings, etc., by rootlets, has a porous stem of irregular cross-section, often flattened laterally when old. When it is young and approximately cylindrical, the pith is always nearest to the outer edge, which is strange, for one would expect the stem to grow fastest on the side away from its support.

Bignonia crucigera, the cross-vine, a tendril-climber of the same family, has a four-winged pith making a plus mark in cross section, by means of which a piece of the stem can be easily split into four quarter-round pieces. Some tropical members of the same family have other curious pith forms.

When one sees a forest abounding in woody vines one can be reasonably certain that fire is an unusual and abnormal occurrence there, for nearly all vines seem to be sensitive to fire. They are scarce or wanting in the northern spruce forests, which are swept by fire about once in the lifetime of a tree, and in the southern long-leaf pine forests, which under natural conditions are burned over every few years, the fires being set by lightning or otherwise. (See "The Forest That Fire Made", by S. W. Greene, in American Forestry for October, 1931, and my article on the forests of Alabama in the same magazine eighteen years before, and on the coniferous forests of eastern North America, in the Popular Science Monthly for October, 1914.)

The Japanese honeysuckle, *Lonicera japonica,* originally cultivated for ornament, or for its fragrant flowers, has now become a pest in the southeastern states, and occasionally as far north as New York, having taken possession of many bits of woodland that are protected from fire by their small size, by swamps on one or more sides, or by their proximity to dwellings, and it tends to choke out nearly all plants except the trees that support it; and if those die from old age or any other cause no others can come up through the dense mass of vines to replace them. And it is not practicable to get rid of the honeysuckle by burning it, for it is evergreen, and a fire hot enough to destroy it would kill the other vegetation too.

Roland M. Harper.

University, Alabama.

The article referred to appeared in Nature Magazine for August, 1937.

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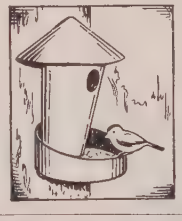

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The ASSOCIATION

While some conservation activities have been carried on for many years, conservation education is a comparatively new development. Its introduction into the grade and high schools is most recent, but there are definite indications that many States will follow the pioneers by incorporating conservation in school programs in some way.

What bearing the work being carried on by a wide variety of agencies might have on such school programs has been a matter of conjecture. What cooperation might be expected from these agencies has been equally a question. In order to bring together data and permit a reasonably complete analysis of the current situation, the directors of The American Nature Association have for two years made grants to Cornell University for special conservation studies. These have been carried on under the direction of Dr. E. Laurence Palmer. A tremendous amount of information has been assembled and organized. This is generally analyzed in Volume One, Number Three of *The American Nature Association Quarterly Bulletin.*

This *Bulletin,* as with its predecessors, is now available to all members of the Association desiring it. Owing to the high cost of printing and postage that would be involved, and to the specialized character of these bulletins, it is not feasible to mail one to each member, so individual requests must be made.

•

Part of the conservation education work of the Association has been made possible through the Julia Pope Memorial Fund for Conservation Education established with The American Nature Association by Mrs. Charles Tyler Miller of Detroit.

•

Preparatory work has now been completed on the 1939 Association calendar to be given to members renewing their annual dues, and to new members. Entirely different from previous calendars and portfolios, the 1939 calendar presents twelve noted naturalists through specially-drawn studies and concise stories of their lives. This membership gift has outstanding permanent value.

•

In our editorial on Page 546 we invite support of The Trustees of Public Reservations in Massachusetts in their effort to save the dinosaur tracks. It is more appropriate here to call attention to the fact that John S. Ames, 96 Ames Bldg., Boston, Mass., is treasurer of this organization. Since 1891, The Trustees of Public Reservations have secured and turned over to the Commonwealth, as State Forests or Parks, thirty-seven reservations of great value.

Membership Application Blank

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For Flower Collectors

Earle S. Anderson, Massachusetts biology teacher, has turned to the versatile cellophane to work out some practical herbariums for plant collectors. Available in loose-leaf form in sizes of seven by nine inches and nine by twelve inches, these consist of a binder and insert pages, plus sheets of cellophane for covering the plant specimens. Space is provided for the collectors record. In an accompanying instruction book, Mr. Anderson gives advice on collecting and preserving specimens and emphasizes the wild flowers that should not be picked due to their scarcity. A special herbarium for use by young summer campers is also provided. Moderately priced, these should find much favor with amateur botanists, young and old.

Film Strips Available

Prices for the film strips available from the Extension Service, United States Department of Agriculture, Washington, D. C., will be lower during the current fiscal year. Three hundred series of these strips are now completed, covering such subjects as soil conservation, farm crops, farm animals, farm forestry, plant and animal diseases and pests, roads, farm economics, home economics and adult and junior extension work. These strips have proved popular with teachers and extension workers. Lists of the available strips and instructions on purchase may be obtained from the Extension Service.

Geyser Data

Virtually the entire issue of *Yellowstone Nature Notes* for September-October is devoted to latest information on the habits of some of the Yellowstone geysers. Of particular interest is the effort to compile absolute data on the activities of Old Faithful, covering the time and duration of eruptions, height of water column and amount of water thrown out. It has been difficult to get accurate and unprejudiced information, and even the electric eye has proved inadequate in recording this famous geyser's habits.

Bird Booklet

A bird booklet, recently issued by the Palisade Press, 280 Broadway, New York City, is available on request. This publisher brings out Bert Dayton's bird and Nature books.

Window Bird Feeder

Incorporating improvements in design and construction, a new bird feeder for window use has been brought out by Welles L. Bishop. Substantially built of rustic hemlock and stained pine, it has a glass roof that protects food from weather and at the same time permits convenient observation of the bird guests.

From the South

Two related books come to us from the same publisher—*Southern Nature Stories* by Baker, Harris and Rogers, and *Southern Forestry* by Elliott and Mobley. These are school texts designed to fit into Nature study and forestry study work in schools in the South. The Nature book is the first of a series by three Georgia naturalists and educators. The publisher is Turner E. Smith and Company, Atlanta. The books list for 88 cents and $1.60 respectively.

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Photographic Notes

BY NORRIS W. HARKNESS

Shooting From Ambush

On rare and happy occasions it happens that something built for one particular purpose becomes more useful in some other direction. Such is the story of a small shooting preserve that a friend of ours made by damming a tiny stream in the early part of the century. The resulting pond was surrounded by an acre or two of swamp that made a splendid over-night stop for the great flocks of ducks and geese that travel over New England annually. The solidly constructed blind was left to the elements when this friend gave up shooting and dedicated his little wilderness as a bird sanctuary, and the spot had not been visited by man for several years when we finally prevailed upon him to allow us to try for some photographs of his guests at home. The blind required a lot of rebuilding to make the openings suitable for unimpeded camera shooting, and much effort was expended to make the floor dry enough to be comfortable in the cold hours of near-winter dawn. Three days elapsed between the renovation of the blind and the try for pictures, and on a bitter cold morning, we took our stand nearly an hour before daylight.

Our equipment consisted of two cameras—a miniature with a fast lens for the early shots before the sun rose, and an inexpensive 3¼" x 4¼" view camera fitted with a ten-inch telephoto lens that was much too slow to be effective in poor light. The cameras were loaded with the fastest film then available to us, Agfa Superpan; the vest-pocket size in the small camera and film-pack in the larger. Today's super films would have helped to simplify the problem of sufficient shutter speed and enough exposure in the early light, but they were unknown and so unmissed. The other equipment taken was a steady tripod and the exposure meter, which was hung from a convenient stick so that it would be immediately at hand and yet out of the way and in no danger of falling. A lens-hood was slipped on each lens to allow working more nearly toward the light without flare and consequent loss of crispness in the negatives.

THESE CANADA GEESE WERE "SHOT" BUT FLEW ON THEIR WAY SOUTH

In the long hour or more before there was sufficient light to attempt any exposures, the cameras were focused on what seemed to be the most popular landing space in the pond. The larger camera was set up on the tripod with the lens wide open and carefully focused. Unfortunately, two large trees and the high bushes on our side of the pond prevented our seeing the birds approach, but we were warned of their coming by the excitement of those already arrived, and only a few stragglers landed without our knowledge, although we could not get any shots of their formations as they came in. The first negatives were disappointing. Shot at 1/25th second, they showed only blurs where there should have been wings and heads. As the light became stronger the shutter speed was increased to 1/100th, and then to 1/300th, the fastest possible on our camera. The exposures at 1/100th were fast enough for birds on the water but did not "stop" those in the air, and the shots at 1/300th were, on the whole, more satisfactory, although a little motion in a wing-tip gives some of the pictures an added feeling of rapid action. With the constant fear that each group would be the last, as many exposures were made as absolutely quiet action permitted, and many of the pictures show the lack of the timing that is necessary if the composition of the finished print is to be of the best. When the sun began to shine directly on the pond, the larger camera with its slower lens came into use. It was difficult to determine the right exposure for the birds that had "gone ashore", but we established an approximate reading by pointing the meter at the near shore at about the same angle as the sun's rays. The shot of the two geese herewith was made at about seventy feet with an exposure of 1/25th second at f/6.3, the maximum aperture of the telephoto. The readings given by the meter seemed long, but when the negatives were developed, we found that the exposures were nearly correct. The dawn light is most deceiving, even to the experienced eye, and it rarely pays to doubt a meter with which one is familiar.

DUCKS "SHOT" BY THE CAMERA AS THEY COME IN IN THE MORNING

The shots made were interesting for their subject matter, but the developers in use today were not available, and the negatives are too grainy to make good prints after the small images are enlarged enough for pictorial purposes. Since, then, these pictures fell so far short of what we had hoped, and it was not possible to go back for more, our chief gain was in the knowledge of what to do next time—an occasion that has not yet presented itself. When it does—and we hope it will—we shall take two cameras again and with the same sort of lens equipment. We shall try to get the fascinating geometrical patterns of the flights—and the birds at rest—with the fast lens while the light is weak, and use the longer lens for shots of small groups and individual birds after the sun is higher. The small camera, if it uses 35-mm film, will be loaded with Eastman Plus-X, as a compromise between the faster Super-XX and the less grainy Panatomic-X. If it uses roll-film, it will contain Agfa Superpan Press, and the larger camera will use this or the Eastman Super Panchro Press. Since the light in the early hours is weak in the blue component that makes filters advantageous, the filter is not necessary and will only require longer exposures. The telephoto will be used on the tripod until the shutter speed can be at most 1/100th of a second, and the meter will be used faithfully for every shot. We shall make as many exposures as is consistent with the effort to make each one a worthwhile pictorial composition. It is far better to have fewer negatives and some that have value in every way than to shoot more and have all of them lack the element that removes them from the snapshot class and makes them *pictures*. Finally, we shall develop the negatives as carefully as possible in a familiar fine-grain developer. The larger ones will receive the same treatment, for it may be necessary to use some small section of them for the final picture. For the best negatives, we shall naturally see to it that the developer, the rinse-bath, and the hypo are all at exactly the same temperature and that the washing is complete and the drying as fast as is possible without heat.

So our plan is well formed. We hope to have a chance to carry it out.

* * *

Making Christmas Cards

It is none too soon for the photographer to be getting his Christmas greetings ready. Most of us decided long ago to make the best possible cards for the coming season, but such seasons have a way of arriving before we expect them, and year after year finds us rushing either to finish their printing or, to our shame, to buy them at the last minute. For many of us, it is better that we *should* buy our cards, for unless we are willing to spend enough time and thought and effort on the design and printing of our photographic cards to make them memorable when they are received, we should not attempt them. A poorly done card is no compliment to its recipient, and no credit to its sender.

But we have decided to make our own and we have picked out the negative we wish to use. Perhaps we have several negatives that will express the thought of the season and our own personality. The wise man has made a few pictures for that very purpose—a snow scene or two, or shots of last year's Christmas tree, or some scene that

visualizes to him his ideas of what such a greeting should mean. The negative settled upon and the number of cards needed being decided, the first step is to try the negative with different grades of paper to determine which grade of contrast is necessary. Then buy the paper, but be sure to get the envelopes at the same time. Photographic stores have a habit of being "out" of such supplies at the last minute. Be sure to get a liberal supply for we shall surely spoil some of the paper and, if the cards are as good as we want them to be, we shall just as surely expand our mailing list.

The design of the card is the next step. Of course, this will determine the size of the paper and envelopes we need. A single card is the easiest to do and is effective, although less so than the folded card. Regular double-weight paper is best for the flat card, and a lighter, single-weight paper is better for the folded. (We must remember in our designing that the emulsion is on only one side of the paper—we cannot print photographically on both sides.) There are several kits on the market that will give us our greetings and the masks for our printing, but the masks are easy to make and we can work out our own unique decorations and greetings quite quickly. Red post office paper makes a good mask with heavy paper strips pasted to act as a guide to printing where two adjacent edges of the paper will lie. Holes are cut in the red paper to frame the pictures and greeting. The negatives may be attached to the mask with paper—or scotch tape—and ought to be fastened with the emulsion away from the mask so that there will be close contact between the negatives and the paper when the exposure is made.

All that remains is the greeting negative, or any special designs that we may wish to use. Whether these be drawings or printed, they may be photographed, or, if we do not feel that we can do this part of the job ourselves, the neighboring photographic store will do it at small cost. These negatives should be made as contrasty as possible. A film like "Process" should be used and the developer should be strong and with a larger amount of Potassium Bromide than usual. The final negative should be opaque except for the lettering or lines which should be clear film. We have occasionally used Agfa Direct Copy film for these negatives, making them the desired size in the enlarger just as we would enlarge any print. Several times we have used this film to change the size of our picture negative so that the cards could be made by the faster contact printing. Full directions for its handling come with the film, and we shall find many uses for it.

We have, then, our picture negative, which is soft or normal, and our extremely contrasty greeting and decorative negative fastened in the red paper mask. A test strip or two will determine the best exposure, and we can proceed as in making ordinary contact prints. The washing must be thorough, for some of our friends may wish to keep our card and we do not want them to fade or become stained. We have found that the cards stay flat better if we give them a five minute soak in a bath of one and one-half ounces of ordinary glycerine in thirty-two ounces of water *after* the completion of the usual washing. Folded cards should be carefully creased on the back where the fold is to be and then folded to the final size before they are bone dry. Be sure, however, that the emulsion is dry before attempting to do anything to them. Damp emulsion is too tender to be handled as roughly as is necessary to make a clean fold. A stack of the folded cards will act very well if they are allowed to finish their drying under pressure.

The dry cards must be trimmed carefully, and we must be sure that every card that we mail is perfect enough to be considered a professional job. It may well be the index of our photographic skill in the mind of the friend to whom we send it. And—address plainly and mail early!

The making of these greetings is an application of contact printing. As such, we include it at this time before going on to the fascinations of enlarging which we shall begin next month. If any special questions or problems arise, we shall be glad to help in any way that we can. Send enough information with your question to enable this department to understand the trouble thoroughly—then we can be of more and quicker assistance.

* * *

This and That

With new films hitting the market, as they do these days, it is difficult for us to get much authentic information as to how we should use them. When a film has been available for some time, we can usually find some one who has used it enough to be able to tell us all we need to know about its speed, but the new films offer us so much that we should take advantage of them as soon as possible. For the surer knowledge of our readers, and to help them to use any film they may prefer with certainty as to how to expose it, we have prevailed upon the importer of the Mini-Photoscope to supply us with his booklet of speed ratings for all the amateur films and most of those used by the professionals. Address this department, and enclose a three-cent stamp for your copy.

* * *

Those interested in the highest type of professional development and printing will benefit by the pamphlet issued by the Pavelle Laboratories of 16 East 42nd Street, New York City. Mr. Pavelle is an A.R.P.S. himself and understands our problems. His organization will gladly send the complete details of their services on request. Address Department E.

* * *

The cause of those unpleasant yellow spots on our older prints is too little or too careless washing. Since there is hypo in the paper as well as in the emulsion, prints require more washing than do negatives: an hour in running water is necessary, or eight changes of water with each print drained thoroughly between changes and then left in the clean water for five minutes will do. Be sure that both sides of the print get attention. Lifting the bottom print off the pile and placing it on top is a good way to insure thoroughness, and piling the prints crosswise, that is with one lying across those next to it, will help.

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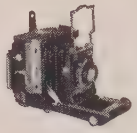

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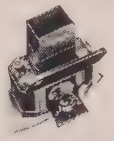

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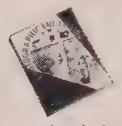

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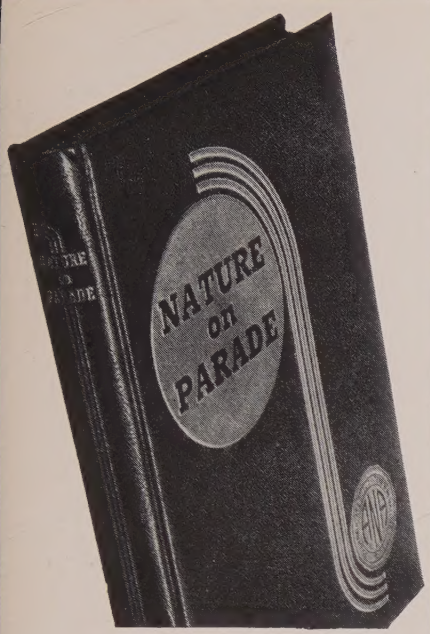

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PHOTOGRAPHIC NOTES

(Continued from page 571)

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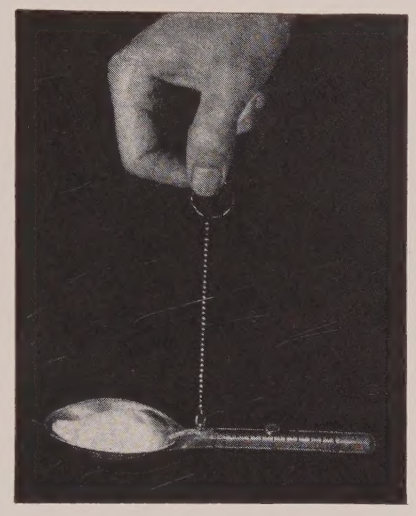

For the photographer who mixes chemicals only occasionally and who must economize on storage space, the Raygram Corporation of 425 Fourth Avenue, New York City, have brought out one of the simplest and yet cleverest gadgets we have seen in some time—the Weigh-Spoon. It is a small spoon suspended on a chain, with a weight that may be moved along to weigh accurately any amount up to 10 grams. The Raygram Corporation has a catalog of this and other products that will interest any photographer. Don't fail to mention NATURE MAGAZINE when you write to them for it.

* * *

The tedious job of mounting Kodachrome slides has been greatly simplified by the advent of the new Magno Frames, which work like plate-holders, allowing the film, held firmly between two pieces of good glass, to slip into place in the frame and lock into position automatically. There is no need for binding tape or any mask other than the frame itself, and they may be used over and over again without tools or trouble. The Photo Marketing Corporation of 10 West 33rd Street, New York City, has a circular on these Magno Frames and on the companion Magno Viewer for its display which it will gladly mail to you on request. Please mention NATURE MAGAZINE.

* * *

We hope that the readers of this department will consider that it belongs to them. It is our earnest wish that it contain the kind of information that will be of the greatest assistance.

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Eleanor King and Wellmer Pessels

The perfect handbook for the amateur who may not have expensive equipment. Here is a picture of the moon taken through a street telescope. Here are pictures of pigeons, baby owls, a flock of sheep, a close-up of a pig. This book tells the beginner what he needs to know from the artistic point of view—not how to take but what to take. Illustrated with many photographs. "A Splendid 'how' book for all picture-snappers." *Young America.*

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1214—16th St., WASHINGTON, D. C.

For Your Photographic Files

The following bulletins have been announced from time to time in our Photographic Notes. You may have missed them. Check those you want and send this list, with a three-cent stamp, to: Photographic Editor, Nature Magazine, 1214 16th Street, Washington, D. C.

Picture Taking at Night ☐
At Home with Your Kodak ☐
Outdoor Exposure Guide ☐
See America with Graflex ☐
Capturing the Jungle ☐
Focal Plane Photography ☐
Modern Developing Technique ☐
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Indoors and Out

By HOWARD ZAHNISER

LIFE moves so fast these days—these *advanced* days, we sometimes call them—that writers for December periodicals find themselves putting their thoughts into words while the autumn foliage is still in color—preparing copy for many readers who will be hugging firesides in late November, the thanksgiving season. Fortunately for the writers, year's end being calendar time for backward looks, the moods of autumn are reminiscent, and one certainly hopes that readers will find remembrances in harmony with the spirit of thankfulness. Yet there is, after all, something disturbing in these circumstances that force us, even in our periodical reading, to dispense with December before December ever comes.

Looking back over the year's "Indoors and Out" pages, one (and there may be others) can see a recurrence of two difficult problems arising from a desire to enjoy the outdoors. One of course is that of preserving the wild places we still have and the creatures that inhabit them. The other is that of finding time to know the outdoors, time to feel its influences; or in other words, how to manage the time indoors so as to permit one to get out. The first paragraph of this year's pages dealt with (and I, an inveterate quoter, take pleasure in quoting myself) "the poet-naturalist of Concord who set out to demonstrate a personal economy that would make possible both a living and a life." Now it seems fitting to close the year's pages by calling attention to McGraw-Hill's Sunstead Series of books by Gove Hambidge, for he too is engaged in this demonstration.

The handbook that inaugurated this series in 1933—*Time to Live: Adventures in the Use of Leisure*—points out, among other things, that it is "quite possible and desirable to be reduced for hours or days on end to earth, sky, and sun, find the sum total of satisfaction in these alone, and be cleansed and renewed thereby." These are the uses of leisure in which we readers of NATURE MAGAZINE are most deeply interested, but of course they represent only one application of the philosophy expounded in *Time to Live,* and it is the philosophy that is of fundamental importance. Fortunately, from my somewhat evangelistic point of view, this 144-page volume sells for only a dollar and a half and has had at least five printings.

Like the old-fashioned Methodist saints, Mr. Hambidge advances his doctrine through personal testimony. *Time to Live* is replete with his own experiences, which are not only fascinating to read but also encouraging to contemplate. *Enchanted Acre: Adventures in Backyard Farming,* the second book of the series, published in 1935 at two dollars and a half, is in its entirety essentially a testimony that one man for a time at least succeeded in reducing his indoors life to a happy minimum. The interruption in this success came "at a certain point in the great depression," and Mr. Hambidge refers to it in his most recent book *Six Rooms Make a World* (1938; $2.50) with the comment: "There can be no real security for a few until there is greater security for all."

It may be that we can solve even our own peculiar problem, that of indoors management for outdoor enrichments, only by facing our more general social and economic problems first. For most of us these problems tend to have their center in our homes and, this being the case, *Six Rooms Make a World* affords a rare insight into all our relationships. The things that center in and extend out from the attic room (where an individual "thinks his own thoughts and does his own work"), the kitchen and dining room, the bedroom, the children's rooms, and the living room, are about the whole of worthwhile indoors life for many of us, and it would probably be better if this were true of more of us. Mr. Hambidge describes his book as "an account of the struggles of an average individual trying to make up his mind about the nature of the world and its implications for his home," yet it is impossible not to note implications of and from, as well as for, the home. To home folks *Six Rooms Make a World* will indeed have a significance that pertains to the universe, and others may well perceive this too. In fact, Mr. Hambidge has made such a happy choice of a form into which to fit his essays that it seems important to point out that it is a natural, essential form and not merely the result of a clever device. The home is central in all the books of this Sunstead Series.

Mr. Hambidge has not yet given us the volume on the outdoors that, judging from his sensitiveness to natural influences and his dependence on open-air enrichments, must surely find its place in this series eventually. Of the books so far published, *Enchanted Acre* is closest to the interests of NATURE MAGAZINE readers and most delightful in reading. It was written, and the experiences recounted were lived, in love of the land. Its chapters on "Green Leaves" and "Deep Roots", its discussions of insects and other forms of life, and the reader's awareness that the days of the book were spent on a country place, give it charm and a due measure of excitement. Through it all, however, there is the practical note sounded by a writer who is not only living but learning how to live; it is a country book rather than one of the woods, fields, and streams—pastoral rather than wild. Like the other books in the Sunstead Series at present, its value to outdoor folks is in its suggestive dealings with hindrances in the roads that might lead us away from cities and dwelling places. We can not read these books, as we do many, for vicarious enjoyment of wild things, but we can see in them how we can improve our own opportunities and through what may seem indirection "find direction out." Certainly they are contributions to the happiness of December days indoors and peculiarly appropriate to the home days at the Christmas season. Best of all they perhaps comprise an introduction to another Sunstead book in which our own peculiar interest will be more directly aroused, even as they may be an introduction to happier new years in our own schemes of living. At any rate, it is one of our best wishes for the season.

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I OBSERVED A PURE ALBINO RED-TAILED HAWK"